TECHNICAL BULLETIN

# INSTALLATION MASTER PLAN PREPARATION

HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1988

TECHNICAL BULLETIN
NO. ENG 353

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *9 August 1988*

# INSTALLATION MASTER PLAN PREPARATION



***This bulletin supersedes TB ENG 353, dated 30 December 1966 and TB ENG 353–1, dated 26 April 1965.**

## LIST OF FIGURES

## LIST OF TABLES

# CHAPTER 1
# INTRODUCTION

**1–1. General.** The overlay-composite system is a means of map production by which a base map and one or more sheets or overlays of map information are combined on a single sheet or composite. The system consists of overlay preparation and composite production. Base maps and overlays are registered and then prepared by either manual or computer-aided means. Composite maps are produced by photographically combining the base map and the registered overlays. The overlay-composite system is a flexible, efficient and economical means of map production for the following reasons:

—One base map can be used with multiple overlays.
—An overlay can be screened to highlight or de-emphasize features on the composite map.
—Information common to several composite maps only needs to be drawn on one overlay.
—Specific subject data is contained on one overlay to simplify updating.

**1–2. Purpose.** The purpose of this bulletin is to provide guidance on the content of overlays, describe common methods and techniques of overlay preparation, and explain the production of composite maps. This bulletin emphasizes the quality control necessary to produce composite maps regardless of the method of production used. The guidance provided herein is intended to ensure consistent preparation of high quality Installation Master Plan Maps.

**1–3. Scope.** The scope of this document includes the following three categories of master plan maps:

*a. Existing Conditions Maps.* These maps depict the current physical layout of the installation. The Existing Conditions Maps are the base maps for the Future Development and Mobilization Development Plans.

*b. Future Development Plans.* These plans show the installation's future development as described in the master plan narrative. All required construction is sited on the Future Development Plans.

*c. Mobilization Development Plans.* These plans show the siting of mobilization facilities that are required to support the installation's mobilization mission.

*d.* A list of Installation Master Plan Maps described in this document is shown on table 1–1.

*Table 1–1. Installation Master Plan Maps*

GENERAL
- Title Sheet
- Index Sheet

EXISTING CONDITIONS MAPS
- Regional
- Airspace Surfaces
- Airfield Approach-Departure
- Airfield Layout
- Installation Land Use
- Building Area Land Use
- Development Constraints
- Range and Training Area
- Real Estate
- Site Map
- Tree Cover
- Transportation
- Water
- Wastewater
- Natural Gas
- Electrical
- Lighting
- Telecommunications
- Central Heating and Cooling
- Storm Drainage

FUTURE DEVELOPMENT PLANS
- Regional
- Installation Land Use
- Building Area Land Use
- Range and Training Area
- Site Plan
- Tree Cover
- Transportation
- Water
- Wastewater
- Natural Gas
- Electrical
- Lighting
- Telecommunications
- Central Heating and Cooling
- Storm Drainage

MOBILIZATION DEVELOPMENT PLANS
- Regional
- Installation Land Use
- Building Area Land Use
- Range and Training Area
- Site Plan
- Transportation
- Utilities and Storm Drainage

**1–4. Organization.** This bulletin is organized into four chapters:

*a.* Chapter 1 provides a brief introduction to the overlay composite system of Installation Master Plan Map preparation. The purpose, scope and organization of the bulletin are also described.

*b.* Chapter 2 discusses each of the composite maps and the necessary overlays for creating

them. Section I describes each of the Existing Conditions Maps and the necessary overlays for creating them. Section II describes each of the Future Development Plans, the overlays necessary for each, and the relationship between the Future Development and Existing Conditions Overlays. Section III describes the Mobilization Development Plans, their respective overlays, and the relationship between the Future Development and Mobilization Development Overlays.

*c.* Chapter 3 describes the standards and methods used in the preparation of overlays. Section I presents the standards for format, graphics and registration. Section II describes the film positive technique for creating overlays, and Section III describes the negative engraved technique. Section IV discusses the characteristics and standards for the automated drafting method of map production.

*d.* Chapter 4 addresses the various techniques used to produce composite maps. The use of screens is discussed, and the contact photographic and photographic projection techniques of film composite production are described.

**1–5. References.** Appendix A contains a list of references used in this document.

# CHAPTER 2
# THE OVERLAY

## SECTION I—EXISTING CONDITIONS MAPS

**2–1. Map inventory.** Existing Conditions Maps show the installation as it exists today. The specific number and type of maps required for an installation depends upon the features, conditions, and requirements of the installation. Usual Existing Conditions Maps include but are not limited to:

—Regional.
—Airspace surfaces.
—Airfield approach-departure.
—Airfield layout.
—Installation land use.
—Building area land use.
—Development constraints.
—Range and training area.
—Real estate.
—Site map.
—Tree cover.
—Transportation.
—Utility to include:
  —Water.
    Wastewater.
    Natural gas.
    Electrical.
    Lighting.
    Telecommunications.
    Central heating and cooling.
—Storm drainage.

**2–2. Overlay Composite Schedule.** Overlays necessary to prepare each Existing Conditions Map are identified in table 2–1. Appropriate map scales are identified. To emphasize the more important information and allow better readability certain overlays are screened. The overlays to be screened and the percent of full strength are specified in table 2–1. The Overlay-Composite Schedule, table 2–1, should be adjusted to reflect the individual mapping situation and requirements of each installation. The overlays necessary to make a composite of the Existing Conditions Site Map are shown in figure 2–1. Five overlays are prepared in order to make this map:

—Environmental/safety restrictions.
—Building numbers.
—Topography.
—Base map.
—Border, title and legend.

As illustrated, each overlay contains certain specific information. These overlays of information are combined onto one sheet to form the Existing Conditions Site Map. Since the Environmental/ Safety Restrictions and Topography Overlays are secondary in importance for this map, these two overlays are de-emphasized by screening them back to 40 percent of full strength. The first four overlays are used to prepare other Existing Conditions Maps, Future Development Plans, and Mobilization Development Plans. The fifth overlay, Border, Title and Legend Overlay, is prepared separately for each map. The one-time preparation procedure for the Border, Title and Legend Overlay is explained in chapter 3, paragraph 16. Various base map overlays will be used depending upon the desired base map features and scale for each map.

**2–3. Existing Conditions Regional Map.** The Regional Map depicts an area approximately 100 miles square and shows the location of the installation relative to a region. It provides the basis for analyzing regional planning factors affecting the installation. The scale of the map normally will be 1 inch = 4 miles, or 1:250,000. Locate the installation in the center of the map. Figure C–4 shows the preferred arrangement of data. The Regional Map is made up of the following overlays:

*a. Base Map Overlay.* The United States Geological Survey (USGS) quadrangle maps shall be used to prepare the Base Map Overlay. Exclude topographic contours and woodlands.

*b. Aeronautical Data Overlay.* Pertinent regional aeronautical data shall be shown in the Aeronautical Data Overlay. For additional aeronautical symbols not shown in figure C–1, use symbols on Department of Commerce National Oceanic and Atmospheric Administration (NOAA) aeronautical charts. This overlay is optional.

*c. Regional Data Overlay.* The installation boundary will be drawn and labeled. Locate the installation in the center of the map. Show other Department of Defense activities in the area and label each by name or reference number with an identification list.

*d. Border, Title and Legend Overlay.* Include a vicinity map, state map, and the source and date of the Base Map Overlay. Figure C–4 shows the preferred sheet format.

(1) *Vicinity Map.* Show the installation out-

*Table 2–1. Existing Conditions Maps—overlays and film composites.*

| EXISTING CONDITIONS MAPS | | Overlay | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Composite Map | Scale | Border, Title, and Legend | Base Map | Topography | Building Numbers | Aeronautical Data | Airspace Suface Data | Airfield Approach Plan and Profile | Tree Cover | Transportation Facilities | Development Constraints | Regional Data | Land Use | Range and Training Areas | Real Estate Data | Airfield and Runway Data | Environmental/Safety Restrictions |
| Regional | 1" = 4 Mi. | F | F | | | S(40)[a] | | | | | | F | | | | | |
| Airspace Surfaces | 1" = 1 Mi. | F | S(40) | | | | F | | | | | | | | | | |
| Airfield Approach-Departure | 1" = 2,000' | F | | | | | | F | | | | | | | | | |
| Airfield Layout | 1" = 100' to 400' | F | F | S(40) | F | | | | | | | | | | | F | |
| Installation Land Use | Cover total installation on one sheet | F | S(40) | | | | | | | | | | F | | | | |
| Building Area Land Use | Variable. Combine all Site Maps on one sheet. | F | S(40) | | | | | | | | | | F | | | | |
| Development Constraints | Same scale as Installation Land Use Map | F | S(40) | | | | | | | | F | | | | | | |
| Range and Training Area | Same scale as Installation Land Use Map | F | S(40) | | | | | | | | | | | F | | | |
| Real Estate | Same scale as Installation Land Use Map | F | S(40) | | | | | | | | | | | | F | | |
| Site Map | 1" = 100' to 1" = 400' | F | F | S(40) | F | | | | | | | | | | | | S(40) |
| Tree Cover | Scale of Site Map | F | S(40) | | | | | | F | | | | | | | | |
| Transportation | Scale of Site Map | F | S(40) | | | | | | | F | | | | | | | |

*Table 2–1. Existing Conditions Maps—overlays and film composites—Continued.*

| EXISTING CONDITIONS MAPS | | Overlay | | | |
|---|---|---|---|---|---|
| Composite Map | Scale | Border, Title, and Legend | Base Map | Topography | Utility Data |
| Water | Scale of Site Map | F | S(40) | S(40)[a] | F |
| Wastewater | Scale of Site Map | F | S(40) | S(40)[a] | F |
| Natural Gas | Scale of Site Map | F | S(40) | | F |
| Electrical | Scale of Site Map | F | S(40) | | F |
| Lighting | Scale of Site Map | F | S(40) | | F |
| Telecommunications | Scale of Site Map | F | S(40) | | F |
| Central Heating and Cooling | Scale of Site Map | F | S(40) | | F |
| Storm Drainage | Scale of Site Map | F | S(40) | S(40) | F |

Notes: F = Full Strength Image
S(40) = Screened Image (% of Full Strength)
a = Optional Overlay

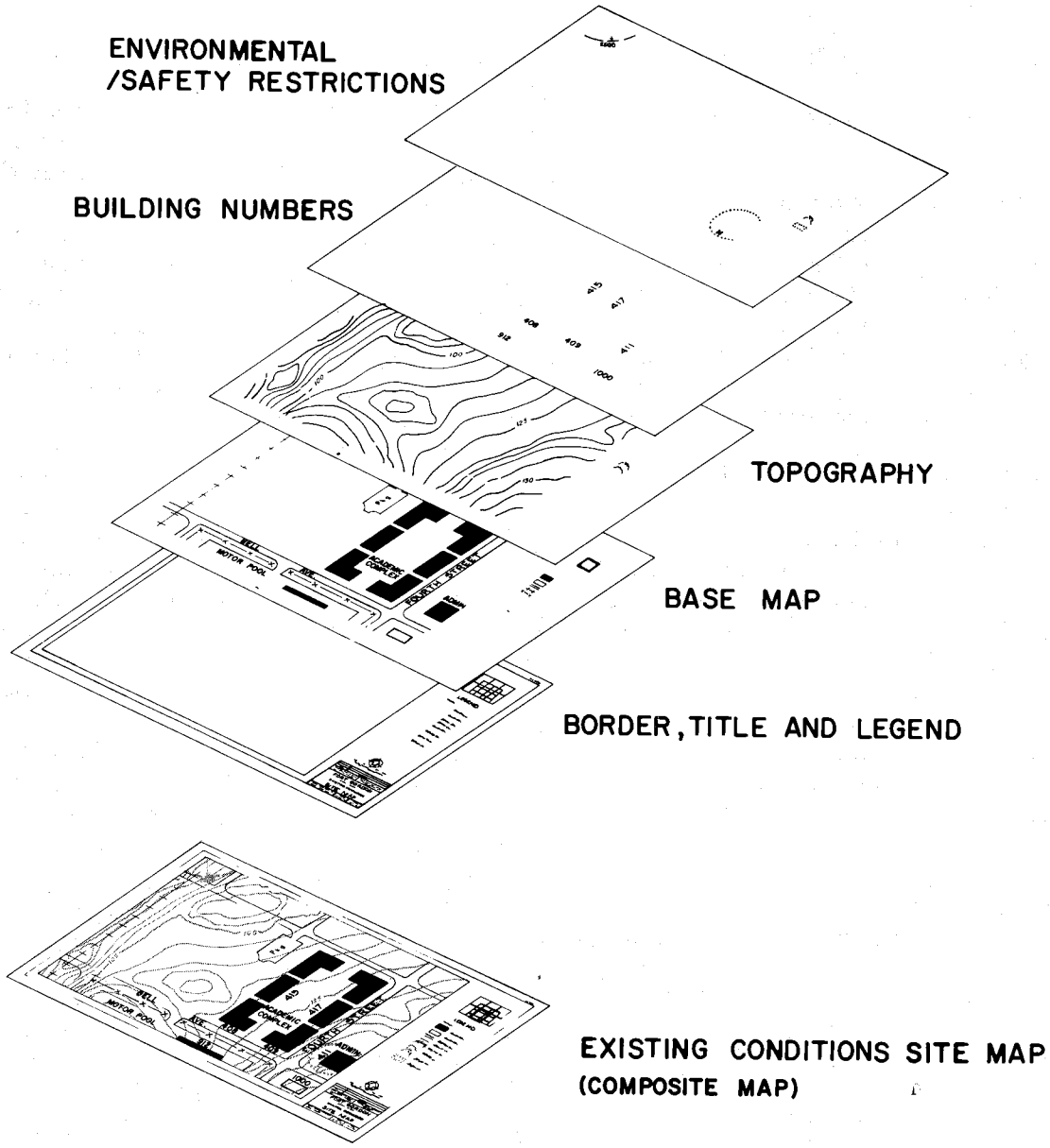



*Figure 2–1. Existing Conditions Site Map.*

line, major roads, railroads and water areas. Figure C–6 shows an example Vicinity Map.

(2) *State Map.* Within the state boundary, locate the installation and a minimum of two major cities. Figure C–5 shows an example State Map.

**2–4. Existing Conditions Airspace Surfaces Map.** For each installation airfield, heliport and helipad, show a plan view of the fixed-wing and rotary-wing aircraft airspace imaginary surfaces. An isometric view of the imaginary surfaces will be shown in accordance with TM 5–803–4 and TM 5–803–7. Legend symbols for this map are shown on figure C–2. The Airspace Surfaces Map is made up of the following overlays:

*a. Base Map Overlay.* USGS topographic quadrangle maps will be used to prepare the Base Map Overlay. Exclude woodlands from the base map. The installation boundary will be drawn and labeled. Standard USGS symbols will be used. Base map symbols will not be identified in the legend.

*b. Airspace Surfaces Data Overlay.* This overlay contains:

(1) Limits of airspace imaginary surfaces related to airfields, heliports and helipads. Identify all planes, surfaces, datum elevations and slope ratios.

(2) Limits of airport control zones, reserved airspace, and centerline of low altitude airways.

(3) Location of obstructions penetrating the airspace imaginary surfaces with the top elevation and obstruction identification number labeled.

(4) Isometric view.

(5) Aircraft noise contours.

(6) Tabulate all air navigation obstructions as shown in figure B–2. When adequate space is not available, tabulate obstructions by number in a separate report and reference each obstruction on the map.

(7) Tabulate the waivers of air navigation criteria as shown in figure B–2. When adequate space is not available, tabulate obstructions by number in a separate report and reference each obstruction on the map.

*c.* Border, Title, and Legend Overlay. This overlay may be combined with the airspace surfaces overlay.

**2–5. Existing Conditions Airfield Approach-Departure Map.** Installation fixed-wing or rotary-wing aircraft approach-departure clearance surfaces will be shown in plan and profile views. The limits of mapping will include surface C, approach-departure clearance surface, as defined in TM 5–803–7. Plan view will be at a scale of 1 inch = 2,000 feet. The profile view will have the same horizontal scale and a vertical scale of 1 inch = 100 feet. The Airfield Approach-Departure Map is made up of the following overlays:

*a.* Airfield Approach-Departure Plan and Profile Overlay. A plan view with a profile view beneath it will be drawn for each approach-departure clearance surface.

(1) *Plan view.* Show buildings, roads, railroads, water areas, towers and topographic contours within the limits of the approach-departure clearance surface. USGS topographic quadrangle maps will be used to prepare the plan view. Standard USGS symbols will be used. Show the end of the runway for reference purposes.

(2) *Profile view.* Elevation profiles of the ground and air navigation obstructions (trees, buildings, etc.) along the centerline of the approach-departure clearance surface will be shown and labeled. Legend symbols are illustrated in figure B–3. The approach-departure clearance surface will be shown and the slope identified. Spot elevations will be shown for the beginning of the approach-departure clearance surface and the end of the runway.

(3) *Obstructions.* All obstructions penetrating above the approach-departure clearance surface will be located in both the plan and profile views. When obstructions are too numerous to show at this scale, an additional, more detailed plan and profile will be prepared at a more suitable scale.

*b. Border, Title and Legend Overlay.* A small scale key map will be shown which defines each runway, helipad, or hoverpoint and identifies the approach-departure zone centerline. This overlay may be combined with the Airfield Approach-Departure Plan and Profile Overlay.

**2–6. Existing Conditions Airfield Layout Map.** The Airfield Layout Map shows each fixed-wing airfield and rotary-wing airfield. The Airfield Layout Map should be placed on one sheet. This map consists of the following overlays:

*a. Base Map Overlay.* The Base Map Overlay will contain the same type of information as the Base Map Overlay of the Site Map. When the Airfield Layout Map is the same scale as the Site Map, the Site Map can be used as the Base Map Overlay.

*b. Topography Overlay.* Same as the Site Map.

*c. Building Numbers Overlay.* Same as the Site Map.

*d. Airfield and Runway Data Overlay.* This overlay includes:

(1) All airfield clearance criteria as listed and described in TM 5–803–4 and TM 5–803–7. Identify slope ratios.

(2) A surface wind rose analysis. Tabulate the source of information, time period, percent wind coverage, and the average highest daily temperature for the hottest month. Prepare the surface wind rose in accordance with TM 5–330.

(3) The runway elevation as identified on NOAA charts.

(4) The airfield reference point coordinates.

(5) The length, width, true bearing, direction numerals and effective gradient in percent for each runway as defined in TM 5–823–4.

(6) Top elevation of tall structures within the airfield safety clearance areas.

(7) Explosive safety quantity-distance and fragment distance for airfields handling explosives.

(8) All air navigational aids and weather observation facilities.

*e. Border, Title and Legend Overlay.* The legend and symbols are the same as those used in the preparation of the Site Map and shown in figure B–8.

**2–7. Existing Conditions Installation Land Use Map.** This map depicts current land uses on the installation and in the vicinity. The scale may range from 1 inch = 200 feet for small installations to 1 inch = 1 mile but must cover the *entire* installation on one sheet. The Installation Land Use Map is made up of the following overlays.

*a. Base Map Overlay.* Show the same information as appears on a USGS topographic quadrangle map. Standard USGS symbols will be used. Base map symbols will not be identified in the legend.

*b. Land Use Overlay.* Within and adjacent to the installation boundary, show the location and extent of land use areas. A land use classification system is shown in figure B–4. Land serving several uses will be classified by the primary use. The land uses can be further qualified; however, the recommended classification system is necessary to ensure that land uses are interpreted consistently between installations and through higher commands. Individual installations may use land use categories in addition to those listed if it is a useful distinction relative to the standard. However, the classification system shown should not be modified to assure that land uses are consistently and uniformly defined. Land use classifications will be represented by symbols, colors or labeled as shown in figure B–4. Identify primary off-post land use adjacent to the installation boundary as: residential; public park, forest, or wildlife area; commercial; industrial; sewage treatment plant; cropland; or grazing land. If a Building Area Land Use Map is prepared, the area covered by this map should be identified and labeled on the Installation Land Use Map.

*c. Border, Title and Legend Overlay.* This overlay may be combined with the Land Use Overlay.

**2–8. Existing Conditions Building Area Land Use Map.** To enhance readability for installations with a concentrated building area, a separate Building Area Land Use Map will be prepared. This map is prepared similar to the Installation Land Use Map. The Building Area Land Use Map consists of the following overlays:

*a. Base Map Overlay.* Show the entire building area on one sheet. Use the Base Map Overlay of the Existing Conditions Site Map to prepare this overlay.

*b. Land Use Overlay.* Identify the land use areas using the land use classification system in figure B–4.

*c. Border, Title and Legend Overlay.* This overlay may be combined with the Land Use Overlay.

**2–9. Existing Conditions Development Constraints Map.** This map shows the constraints which must be considered in the development of an installation. Since these factors can restrict the land available for development, this map will be prepared at the same scale as the Installation Land Use Map. Film patterns should be used to highlight the constraints and enhance map readability. The map consists of the following overlays:

*a. Base Map Overlay.* Use the base map prepared for the Installation Land Use Map or the Building Area Land Use Map.

*b. Development Constraints Overlay.* Show major factors affecting development. More than one overlay may be needed to clearly illustrate all of the factors affecting development. For example, safety and natural resource constraints can be shown on separate overlays. Figure B–5 indicates the type of information and level of detail to be shown on this overlay. As a minimum, the following factors should be identified:

(1) All explosive safety quantity-distance arcs for ammunition storage. Show safety distance for petroleum, oil and lubricant (POL) storage, chemical storage, radiation and electromagnetic hazards. Label hazardous areas by type.

(2) Fragment distance arcs for ammunition storage.

(3) Airfield, heliport, and helipad safety zones including clear zone, approach-departure clearance surface, runway clearance line, helicopter takeoff safety zones and accident potential zones.

(4) Restricted areas. Indicate type of contaminant, i.e.: chemical, explosive or radioactive material. Show areas with special security restrictions.

(5) Noise contours. Including Installation

Compatible Use Zones (ICUZ) outlined in AR 200–1 and AR 210–20 and contours from off-installation sources. Label all noise contours and identify the source of the noise contour information below the legend.

(6) Highlight slopes that are development constraints.

(7) Identify the 100–year floodplain. When it has been determined that no flood hazard exists, add the following note below the legend:

"No portion of the area covered by this sheet lies within the 100–year floodplain."

(8) Identify areas where soil conditions prohibit construction.

(9) Locate sensitive natural areas including wetlands, prime and coastal zone management areas. Label all sensitive natural areas.

(10) Historic Places and Archeological Sites. When no such sites are located in the area, add the following note below the legend:

"No known historical places or archaeological sites are located in the area covered by this sheet."

(11) Other Factors. Show non-renewable resource lands, watershed lands, aquifers and aquifer-recharge areas.

*c. Border, Title and Legend Overlay.* When additional factors affecting development are shown, use different symbols. Base map symbols will not be identified in the legend.

**2–10. Existing Conditions Range and Training Area Map.** This map shows all of the installation's existing range and training areas and facilities. For most installations with major range and training areas, scales of 1:25,000 (approx. 1 inch = 2,000 feet) or 1:50,000 (approx. 1 inch = 1 mile) are desirable. The Range and Training Area Map consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay prepared for the Installation Land Use Map or a similar base map at a more appropriate scale for showing the installation's range and training areas.

*b. Range and Training Area Overlay.* Features to be shown on this overlay are listed on figure B–6. In addition, the acreage of each training area, restricted area and impact area should be tabulated. When adequate space is not available on the sheet, tabulate each area by number in a separate report and reference each area on the map.

*c. Border, Title and Legend Overlay.* Base Map Overlay symbols will not be identified in the legend.

**2–11. Existing Conditions Real Estate Map.** The Real Estate Map identifies the ownership, easement and lease status of all installation real estate. It should not be confused with the official real estate maps maintained by the U.S. Army Chief of Engineers (USACE) District Real Estate Division. The Real Estate Map consists of the following overlays:

*a. Base Map Overlay.* Use the base map prepared for the Installation Land Use Map.

*b. Real Estate Data Overlay.* Information to be shown on this overlay is listed on figure B–7. In addition, tabulate the acreage of the various real estate holdings.

*c. Border, Title and Legend Overlay.* Base map symbols will not be identified in the legend. This overlay may be combined with the Real Estate Data Overlay.

**2–12. Existing Conditions Site Map(s).** The Site Map depicts all existing features of the installation other than utilities and landscape. The Site Map is the Base Map Overlay for the remaining maps including the Tree Cover, Transportation and Utility Maps. It establishes the scale and format of these remaining maps. The Site Map(s) normally are prepared at a scale of 1 inch = 400 feet and consists of the following overlays:

*a. Base Map Overlay.* This overlay includes:

(1) All buildings identified as permanent, semi-permanent or temporary. Building type symbols are shown in figure B–8.

(2) All roads, railroads, parking, hardstand area and trails.

(3) Structures such as bridges, retaining walls, or fences, excluding sidewalks.

(4) All water areas, streams and pierhead lines.

(5) Outdoor recreation facilities.

(6) Cemeteries.

(7) Underground tanks.

(8) Labels for principal buildings, roads, railroads, trails, water areas, streams and cemeteries.

*b. Topography Overlay.* Show topographic contours and 100–year floodplain outline. Identify contour interval. The scale of the map and installation will dictate the contour interval. Contour intervals are usually 2–foot and 5–foot. Whenever possible update with "as built" grading plans. The Site Map is a planning tool and does not require the same degree of topographic accuracy as construction plans.

*c. Building Numbers Overlay.* All building numbers will agree with the Building Information Schedule. The prefix "P", "S" or "T" need not be shown on this overlay as this information is identified by symbol on the Base Map Overlay. All building numbers will be placed for maximum legibility.

*d. Environmental/Safety Restrictions Overlay.* This overlay shows existing environmental/safety restrictions which affect the siting of buildings and facilities. Show explosive safety quantity-distance arcs; fragment distances; airfield and helipad safety zones; noise contours; range surface danger zones; unsuitable soils; sensitive natural areas; historical buildings, places, and archaeological sites. Symbols for these restrictions are shown in figure B–8.

*e. Border, Title and Legend Overlay.* If there is more than one site map, a key map similar to figure C–8 will be drawn. Further description of the key map is in chapter 3, paragraph 3–2.

**2–13. Existing Conditions Tree Cover Map.** Locate the tree cover on the installation. Identify the dominant tree species as shown in figure B–9. The Tree Cover Map consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay prepared for the Site Map(s).

*b. Tree Cover Overlay.* In addition to the tree cover as shown in figure B–9, show fire lanes, water tanks, lookout towers and memorial trees.

*c. Border, Title and Legend Overlay.*

**2–14. Existing Conditions Transportation Map.** This map shows the transportation network providing access to the installation. The Transportation Map consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay prepared for the Site Map(s).

*b. Transportation Facilities Overlay.* Information to be included on this overlay is shown in figure B–10.

*c. Border, Title and Legend Overlay.*

**2–15. Existing Conditions Utility and Storm Drainage Maps.** These maps depict the trunklines and primary components of each utility system. Each map consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay of the Site Map(s).

*b. Topography Overlay.* Use the Site Map(s) Topography Overlay. Contours will be shown on the Storm Drainage Map. Contours are optional on the Water and Wastewater Maps.

*c. Border, Title and Legend Overlay.*

*d. Utility Data Overlays.* The overlays for each utility system are as follows:

(1) *Water Overlay.* Figure B–11 indicates the type of information and level of detail shown on this overlay. Water service connections, except fire protection systems, will not be shown unless legible at this map scale. Identify the type of fire protection sprinkler system with the appropriate abbreviation placed adjacent to the building being protected.

(2) *Wastewater Overlay.* Figure B–12 indicates the type of information and level of detail shown on this overlay. This overlay will identify industrial and contaminated sewerage systems when they exist. Sewer service connections, except to isolated areas, will not be shown unless legible at this map scale. Show manhole invert elevations (inflow-outflow) and top of rim elevations adjacent to the manhole. When adequate space is not available on the sheet, tabulate manhole elevations by manhole number in a separate report and reference each elevation on the map.

(3) *Natural Gas Overlay.* Figure B–13 indicates the type of information and level of detail shown on this overlay. Gas service connections, except to heating plants and isolated areas, will not be included unless legible at this map scale. Include the storage and rated feeder capacity of peak shaving plants.

(4) *Electrical Overlay.* Figure B–14 indicates the type of information and level of detail shown on this overlay. Secondary electrical lines will not be shown. Include all government-owned substations, including the rated capacity of each transformer, voltage conversion, and capacity of spare transformers. When primary transformers are located inside buildings, indicate approximate location.

(5) *Lighting Overlay.* This overlay will show all lighting for streets, parking areas, motor pools, security lighting and flood lighting. Identify special lighting conditions such as high mast lights, multiple luminaires on one pole, and location of aircraft obstruction lights. Figure B–15 indicates the type of information and level of detail shown on this overlay.

(6) *Telecommunications Overlay.* Figure B–16 indicates the type of information and level of detail shown on this overlay.

(7) *Central Heating and Cooling Overlay.* Figure B–17 indicates the type of information and level of detail shown on this overlay. Where supply and return mains are parallel, identify both by a single line.

(8) *Storm Drainage Overlay.* Figure B–18 indicates the type of information and level of detail shown on this overlay. Roof drains and sub-drains will not be shown. Show structure invert elevations (inflow-outflow) and top of rim or grate elevations adjacent to the structures. When adequate space is not available on the sheet, tabulate structure elevations by structure number in a separate report and reference each elevation on the map. Show only major drainage area boundaries. Include off-post drainage structures affecting the installation.

## SECTION II. FUTURE DEVELOPMENT PLANS

**2–16. Plan inventory.** Future Development Plans graphically portray the proposed development of the installation. The information shown graphically supports the Master Plan Narrative. In many cases, the data necessary for these maps will come from special studies. Future Development Plans need not be prepared for areas in which no future construction is proposed. Indicate on the Index Sheet those sheets which are excluded. Future Development Plans include, but are not limited to:

—Site plan.
—Tree cover.
—Transportation.
—Utility and storm drainage.

Other Future Development Plans may be prepared as required. Airfield plans and real estate plans are prepared when required to show proposed changes to the airfield or reservation. Additional utility plans may be prepared to show features such as air, vacuum or industrial gas lines.

**2–17. Overlay-Composite Schedule.** Overlays necessary for each Future Development Plan are identified in table 2–2. Appropriate plan scales are identified. To emphasize important information and enhance readability, certain overlays are screened. The overlays to be screened and the percentage of full strength are specified in table 2–2. The Overlay-Composite Schedule, table 2–2, should be adjusted to reflect the individual mapping situation and requirements of each installation. The overlays necessary to make a composite of the Future Development Site Plan are shown in figure 2–2. Six overlays are prepared in order to make this plan:

—Environmental/safety restrictions.
—Future development.
—Existing not to be retained.
—Topography.
—Base map.
—Border, title and legend.

As illustrated, each overlay contains certain specific information. These overlays are combined onto one sheet to form the Future Development Site Plan. Since the Environmental/Safety Restrictions, Existing not to be Retained, and Topography Overlays are secondary in importance for this plan, these three overlays are de-emphasized by screening them back to 40 percent of full strength. The Environmental/Safety Restrictions Overlay and Topography Overlay are the same overlays used to make the Existing Conditions Site Map. The Base Map Overlay is a reproducible copy of the Base Map Overlay used to make the Existing Conditions Site Map with the "existing not to be retained" buildings and facilities removed. The Existing not to be Retained Overlay is a new overlay showing only the "existing not to be retained" buildings and facilities. A more detailed discussion of the preparation technique for "existing not to be retained overlays" is contained in Chapter 3. The Future Development Overlay is a new overlay showing proposed buildings and facilities. The sixth overlay is the Border, Title and Legend Overlay. The Border, Title and Legend Overlay is prepared separately for each map. The one-time preparation procedure for the Border, Title and Legend Overlay is explained in chapter 3.

**2–18. Future Development Regional Plan.** Identify proposed regional improvements. When there is no change in regional information, the Existing Conditions Regional Map is used. The Regional Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Regional Map.

*b. Existing Regional Data Overlay.* Use the Existing Regional Data Overlay from the Existing Conditions Regional Map.

*c. Existing Aeronautical Data Overlay.* Use the Existing Aeronautical Data Overlay from the Existing Conditions Regional Map.

*d. Future Regional Data Overlay.* Identify and label changes in the regional development pattern significant to the installation, such as new highways, highway interchanges, airports and airways, cross-country gas or oil transmission lines. Use the legend and symbols shown in figure B–1.

*e. Border, Title and Legend Overlay.*

**2–19. Future Development Installation Land Use Plan.** This plan shows the future land use pattern which reflects the installation's development policies. Guidance for preparing a land use plan is contained in TM 5–803–1. The Installation Land Use Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Installation Land Use Map.

*b. Future Land Use Overlay.* This overlay identifies future land use on the installation, at detached areas, and in the vicinity. For each land use area provide 25 percent additional area for expansion. This expansion area allows for unanticipated growth at the installation. Use the land use classification system shown in figure B–4 and

*Table 2–2. Future Development Plans—overlays and film composites.*

| FUTURE DEVELOPMENT PLANS | | Overlay | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Composite Map | Scale | Border, Title, and Legend | Base Map | Topography | Existing Base Image Not To Be Retained | Existing Regional Data | Existing Aeronautical Data | Future Regional Development | Future Land Use | Development Constraints | Existing Range and Training Areas To Be Retained | Range and Training Areas Not To Be Retained | Future Range and Training Areas | Future Development | Environmental/Safety Restrictions | Existing Tree Cover | Future Tree Cover and Existing Not To Be Retained | Existing Transportation Facilities | Future Transportation Facilities and Existing Not To Be Retained |
| Regional | 1" = 4 Mi. | F | F | | | F | S(40)[a] | F | | | | | | | | | | | |
| Installation Land Use | Cover total installation on one sheet | F | S(40) | | | | | | F | S(40)[a] | | | | | | | | | |
| Building Area Land Use | Variable. Combine all Site Plans on one sheet. | F | S(40) | | | | | | F | | | | | | S(40)[a] | | | | |
| Range and Training Area | Same scale as Installation Land Use Plan | F | S(40) | | | | | | | | F | S(15) | F | | | | | | |
| Site Map | 1" = 100' to 1" = 400' | F | F[b] | S(40) | S(40) | | | | | | | | | F | S(40) | | | | |
| Tree Cover | Scale of Site Plan | F | S(40)[b] | | | | | | | | | | | S(40) | | F | F | | |
| Transportation | Scale of Site Plan | F | S(40)[b] | | | | | | | | | | | S(40) | | | | F | F |

*Table 2–2. Future Development Plans—overlays and film composites—Continued.*

| FUTURE DEVELOPMENT PLANS | | Overlay | | | | | |
|---|---|---|---|---|---|---|---|
| Composite Map | Scale | Border, Title, and Legend | Base Map | Topography | Existing Utility Data | Future Development | Future Utilities and Existing Not To Be Retained |
| Water | Scale of Site Plan | F | S(40)[b] | S(15)[a] | F | S(40) | F |
| Wastewater | Scale of Site Plan | F | S(40)[b] | S(15)[a] | F | S(40) | F |
| Natural Gas | Scale of Site Plan | F | S(40)[b] | | F | S(40) | F |
| Electrical | Scale of Site Plan | F | S(40)[b] | | F | S(40) | F |
| Lighting | Scale of Site Plan | F | S(40)[b] | | F | S(40) | F |
| Telecommunications | Scale of Site Plan | F | S(40)[b] | | F | S(40) | F |
| Central Heating and Cooling | Scale of Site Plan | F | S(40)[b] | | F | S(40) | F |
| Storm Drainage | Scale of Site Plan | F | S(40)[b] | S(15) | F | S(40) | F |

Notes: F = Full Strength Image
S(40) = Screened Image (% of Full Strength)
a = Optional Component
b = Existing To Be Retained Only

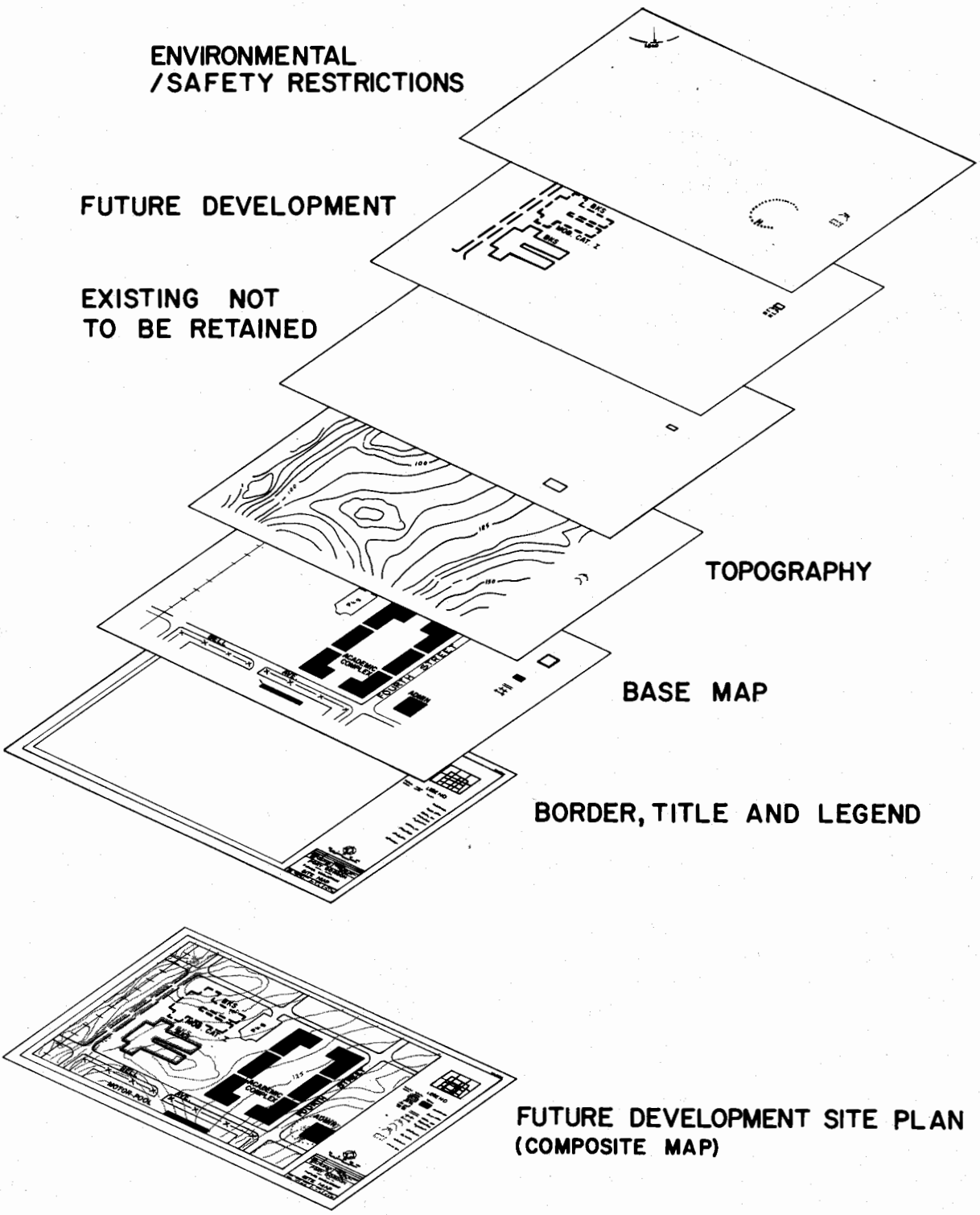



*Figure 2–2. Future Development Site Plan.*

defined in TM 5–803–1. Show future off-post land use adjacent to the installation boundary using the categories identified in paragraph 2–6. If a Future Development Building Area Land Use Plan is prepared, the area covered by this plan should be identified and labeled on the Future Development Installation Land Use Plan.

*c. Border, Title and Legend Overlay.*

*d. Development Constraints Overlay.* This is an optional overlay.

**2–20. Future Development Building Area Land Use Plan.** Prepare this plan similar to the Future Development Installation Land Use Plan. The

Building Area Land Use Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Building Area Land Use Map.

*b. Future Land Use Overlay.* Prepare this overlay similar to the Future Land Use Overlay for the Future Development Installation Land Use Plan.

*c. Border, Title and Legend Overlay.*

*d. Environmental/Safety Restrictions Overlay.* Use the Environmental/Safety Restrictions Overlay of the Existing Conditions Site Map to prepare this overlay. This overlay is optional.

**2–21. Future Development Range and Training Area Plan.** This plan shows all of the installation's proposed outdoor range and training areas and facilities. The Range and Training Area Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Range and Training Area Map.

*b. Range and Training Areas to be Retained Overlay.* Show all of the existing range and training areas and facilities that are to be retained for future use. This overlay is a reproducible copy of the Existing Conditions Range and Training Area Overlay with the "existing not to be retained" items removed. A more detailed discussion of the preparation technique for "existing to be retained" overlays is contained in chapter 3.

*c. Range and Training Area not to be Retained Overlay.* Show all of the range and training areas and facilities that are not to be retained for future use.

*d. Future Range and Training Area Overlay.* Show all the proposed outdoor range and training areas and facilities. Figure B–6 indicates the type of information and level of detail to be shown on this overlay.

*e. Border, Title and Legend Overlay.*

**2–22. Future Development Site Plan.** The Site Plan depicts all relocations of installation activities into new or renovated facilities, planned demolition, replacement of facilities, and major new construction. It is the graphic support for the planning strategies described in the master plan narrative. The Site Plan should reflect a studied estimate of the facilities considered for replacement or retention. Facility sitings should be based on an assessment of all feasible alternatives and represent the most economical, practical and feasible solution in terms of cost and functional development. The Site Plan is the base map for all remaining plans at this scale. Figure B–8 indicates the type of information and level of detail to be shown on this plan. The Site Plan is illustrated in figure 2–2 and consists of the following overlays:

*a. Topography Overlay.* Use the Topography Overlay from the Existing Conditions Site Map.

*b. Base Map Overlay.* This overlay is a reproducible copy of the Base Map Overlay used to make the Existing Conditions Site Map with the "existing not to be retained" buildings and facilities removed.

*c. Existing Base Image not to be Retained Overlay.* This overlay will show any elements of the Base Map Overlay (buildings, facilities, roads, etc.) that are not to be retained. A more detailed discussion of the preparation technique for "existing not to be retained" overlays is contained in chapter 3.

*d. Future Development Overlay.* Show the detailed siting of all required facilities identified in the Tabulation of Existing and Required Facilities regardless of funding. Sitings will not conflict with either existing, permanent facilities, or permanent facilities required for mobilization. Mobilization projects required prior to M-day must be shown and labeled.

*e. Environmental/Safety Restrictions Overlay.* Use the Environmental/Safety Restrictions Overlay prepared for the Existing Conditions Site Map.

*f. Border, Title and Legend Overlay.*

**2–23. Future Development Tree Cover Plan.** Indicate trees and mass plantings required for shade, windbreaks, dust and erosion control, screen planting, and visual aesthetics. Additional guidance relating to tree cover is contained in AR 420–74, TM 5–630 and TM 5–803–5. Figure B–9 indicates the type of information and level of detail to be shown on this plan. The Tree Cover Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Future Development Site Plan.

*b. Future Development Overlay.* Use the Future Development Overlay from the Future Development Site Plan.

*c. Existing Tree Cover Overlay.* Use the Existing Tree Cover Overlay from the Existing Conditions Tree Cover Map.

*d. Future Tree Cover and Existing not to be Retained Overlay.* Identify the location of required tree cover, and show existing tree cover not to be retained. Show future changes in firelanes, water tanks, lookout towers, and memorial trees.

*e. Border, Title and Legend Overlay.*

**2–24. Future Development Transportation Plan.** This plan shows the transportation systems

required to support future land uses and facilities. It will show system improvements necessary to provide the level of service and highway safety anticipated for the land use plan. The type of information and level of detail to be shown on this map is identified in Figure B–10. The Transportation Plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Future Development Site Plan.

*b. Future Development Overlay.* Use the Future Development Overlay from the Future Development Site Plan.

*c. Existing Transportation Facilities Overlay.* Use the Transportation Facilities Overlay from the Existing Conditions Transportation Map.

*d. Future Transportation Facilities and Existing not to be Retained Overlay.* Identify the location of required transportation facilities and indicate those not to be retained as shown in figure B–10.

*e. Border, Title and Legend Overlay.*

**2–25. Future Development Utility and Storm Drainage Plans.** Show the changes to and required trunklines necessary for each utility system to support the installation's long-range development. Each plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Future Development Site Plan.

*b. Future Development Overlay.* Use the Future Development Overlay from the Future Development Site Plan.

*c. Existing Utility Data Overlay.* Use the Utility Data Overlay from the respective Utility or Storm Drainage Map.

*d. Future Utilities and Existing not to be Retained Overlay.* Prepare an overlay for the utility or storm drainage system when trunkline changes are identified. Identify capacity changes for major utility components; such as, electrical substations, water storage tanks, heating plants, water treatment plants and wastewater pumping stations. The type of information and level of detail to be shown on each of these overlays is shown on figures B–11 through B–18.

*e. Border, Title and Legend Overlay.*

*f. Topography Overlay.* This overlay is required for the Storm Drainage Plan and optional for the Water and Wastewater Plans. Use the Topography Overlay from the Existing Conditions Site Map.

## SECTION III. MOBILIZATION DEVELOPMENT PLANS

**2–26. Plan inventory.** The Mobilization Development Plans graphically portray the facilities required to support the mobilization mission of the installation. Preparation of these plans requires the use of overlays from both the Existing Conditions Maps and the Future Development Plans. Mobilization projects shown on the Mobilization Development maps as required prior to M-Day are also shown and labeled on the Future Development Plans. Mobilization Development Plans include, but are not limited to:

—Regional.
—Installation land use.
—Building area land use.
—Range and training area.
—Site plan.
—Transportation.
—Utility and storm drainage.

Other Mobilization Development Plans may be prepared at the installation's discretion. Airfield plans and real estate plans are prepared to show proposed changes in the airfield or reservation.

**2–27. Overlay-Composite Schedule.** Overlays necessary for each Mobilization Development Plan are identified in table 2–3. Appropriate map scales are identified. To emphasize important information and enhance readability, certain overlays are screened. The overlays to be screened and the percent of full strength are specified in table 2–3. The Overlay-Composite Schedule, table 2–3, should be adjusted to reflect the individual mapping situation and requirements of each installation. The overlays necessary to make a composite of the Mobilization Development Site Plan are shown in figure 2–3. Six overlays are prepared in order to make this plan:

—Environment/safety restrictions.
—Mobilization development.
—Future development.
—Topography.
—Base map.
—Border, title and legend.

As illustrated, each overlay contains certain specific information. These overlays are combined onto one sheet to form the Mobilization Development Site Plan. Since the Environmental/Safety Restriction, Topography and Future Development Overlays are secondary in importance for this plan, these three overlays are de-emphasized by screening them back to 40 percent of full strength. The Environmental/Safety Restrictions Overlay, Topography Overlay, and Base Map Overlay are the same overlays used to make the Existing Conditions Site Map. The Future Development Overlay is the same overlay used to make the Future Development Site Plan. The Mobilization Development Overlay is a new overlay showing

proposed mobilization buildings and facilities. The sixth overlay is the Border, Title and Legend Overlay. The Border, Title and Legend Overlay is prepared separately for each plan. The one-time preparation procedure for the Border, Title and Legend Overlay is explained in chapter 3.

**2–28. Mobilization Development Regional Plan.** Use the Existing Conditions Regional Plan Overlays. Prepare a Mobilization Regional Development Overlay which identifies regional requirements necessary to support mobilization development. Identify regional constraints affecting mobilization development. Use the legend and symbols shown in figure B–1.

**2–29. Mobilization Development Installation Land Use Plan.** Shows the land use pattern which reflects the installation's Mobilization Plan. This plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay prepared for the Existing Conditions Installation Land Use Map.

*b. Mobilization Land Use Overlay.* Identify the required mobilization land use pattern. Use the land use classification system shown in figure B–4 and defined in TM 5–803–1. Also identify primary off-post land use adjacent to the installation boundary using the categories listed in paragraph 2–7. If a Mobilization Development Building Area Land Use Plan is prepared, the area covered by this plan should be identified and labeled on the Mobilization Development Installation Land Use Plan.

*c. Development Constraints Overlay.* The Development Constraints Overlay is an optional overlay.

*d. Border, Title and Legend Overlay.*

**2–30. Mobilization Development Building Area Land Use Plan.** Prepare this map similar to the Mobilization Development Installation Land Use Plan. This plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Building Area Land Use Map.

*b. Mobilization Land Use Overlay.* Prepare this overlay similar to the Mobilization Land Use Overlay from the Mobilization Development Installation Land Use Plan.

*c. Border, Title and Legend Overlay.*

*d. Environmental/Safety Restrictions Overlay.* Use the Environmental/Safety Restrictions Overlay from the Future Development Building Area Land Use Plan. This overlay is optional.

**2–31. Mobilization Development Range and Training Area Plan.** This plan shows all of the installation's proposed outdoor range and training areas and facilities required to support mobilization. This plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay from the Existing Conditions Range and Training Area Map.

*b. Range and Training Areas to be Retained Overlay.* Show all of the existing range and training facilities that are to be retained for mobilization use. This overlay is a reproducible copy of the Existing Conditions Range and Training Area Overlay with the "existing not to be retained" items removed. A more detailed discussion of the preparation technique for "existing to be retained" overlays is contained in chapter 3.

*c. Range and Training Areas not to be Retained Overlay.* Show all of the range and training facilities that are not to be retained for mobilization use.

*d. Mobilization Range and Training Areas Overlay.* Show all the proposed outdoor range and training areas and facilities required to support mobilization. Figure B–6 indicates the type of information and level of detail to be shown on this overlay.

*e. Border, Title and Legend Overlay.*

**2–32. Mobilization Development Site Plan.** This plan shows the siting of all proposed facilities listed in the Mobilization Tabulation of Existing and Required Facilities. Figure B–19 indicates the type of information and level of detail to be shown on this plan. This plan is illustrated in figure 2–3 and consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay, prepared for the Existing Conditions Site Map.

*b. Topography Overlay.* Use the Topography Overlay from the Existing Conditions Site Map.

*c. Future Development Overlay.* Use the Future Development Overlay from the Future Development Site Plan with any mobilization projects removed. A more detailed discussion of the preparation of the Future Development Overlay is contained in chapter 3.

*d. Mobilization Development Overlay.* Show the siting of all required facilities identified in the Mobilization Tabulation of Existing and Required Facilities. The siting of mobilization facilities will not conflict with existing permanent buildings or with future required permanent construction. The facilities should be sited based on good site planning principles and be compatible with the Mobilization Development Installation Land Use Plan.

*e. Environmental/Safety Restrictions Overlay.* Use the Environmental/Safety Restrictions Overlay prepared for the Existing Conditions Site Map.

*Table 2–3. Mobilization Development Plans—overlays and film composites.*

| MOBILIZATION DEVELOPMENT PLANS | | Overlay | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Composite Map | Scale | Border, Title, and Legend | Base Map | Topography | Existing Regional Data | Existing Aeronautical Data | Mobilization Regional Development | Future Development | Mobilization Development | Environmental/Safety Restrictions | Existing Transportation Facilities | Existing Utility Data | Mobilization Transportation Facilities and Existing Not To Be Retained | Mobilization Land Use | Mobilization Utilities and Existing Not To Be Retained | Development Constraints | Existing Range and Training Areas To Be Retained | Range and Training Areas Not To Be Retained | Mobilization Range and Training Areas |
| Regional | 1" = 4 Mi. | F | F | | F | S(40)[a] | F | | | | | | | | | | | | |
| Installation Land Use | Cover total installation on one sheet | F | S(40) | | | | | | | | | | | F | | S(40)[a] | | | |
| Building Area Land Use | Variable. Combine all Site Plans on one sheet. | F | S(40) | | | | | | | S(40)[a] | | | | F | | | | | |
| Range and Training Area | Same scale as Installation Land Use Plan | F | S(40) | | | | | | | | | | | | | | F | S(15) | F |
| Site Plan | 1" = 100' to 1" = 400' | F | F | S(40) | | | | S(40) | F | S(40) | | | | | | | | | |
| Transportation | Scale of Site Plan | F | S(40) | | | | | S(15) | S(40) | | F | | F | | | | | | |
| Utilities and Storm Drainage | Scale of Site Plan | F | S(40) | S(15)[b] | | | | S(15) | S(40) | | | F | | | F | | | | |

Notes: F = Full Strength Image
S(40) = Screened Image (% of Full Strength)
a = Optional Component
b = Required on Storm Drainage, optional on other utility plans.

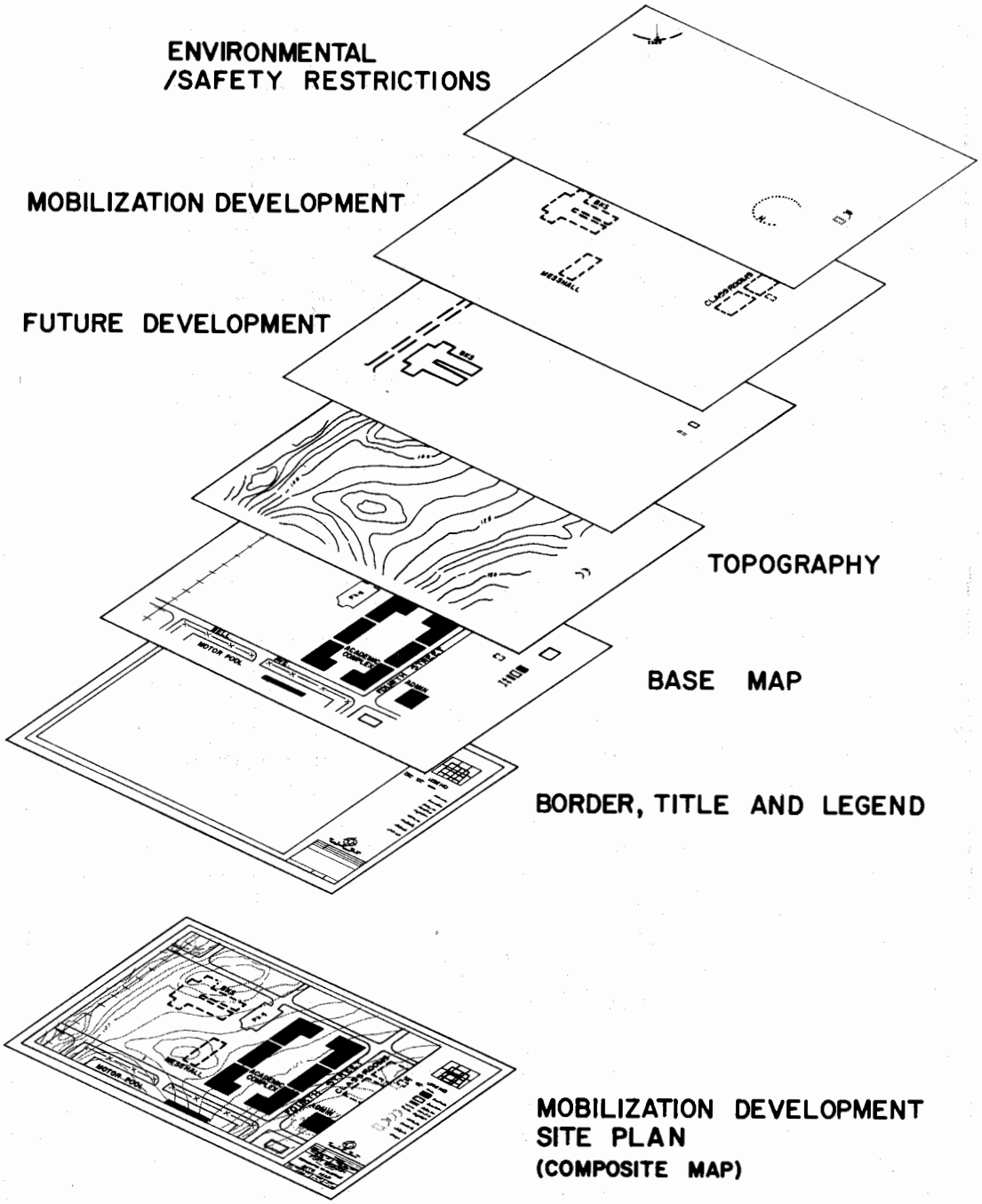



*Figure 2–3. Mobilization Development Site Map.*

*f. Border, Title and Legend Overlay.*

**2–33. Mobilization Development Transportation Plan.** Show all transportation systems necessary to support the required facilities and mobilization mission. The type of information and level of detail to be shown on this plan is identified in Figure B–10. This plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay, prepared for the Existing Conditions Site Map.

*b. Future Development Overlay.* Use the Future Development Overlay from the Future Development Site Plan.

*c. Mobilization Development Overlay.* Use the Mobilization Development Overlay from the Mobilization Development Site Plan.

*d. Transportation Facilities Overlay.* Use the Transportation Facilities Overlay from the Existing Conditions Transportation Map.

*e. Mobilization Transportation Facilities and Existing not to be Retained Overlay.* Show the required mobilization transportation facilities. Iden-

tify the transportation facilities that are to be abandoned or removed as indicated in figure B–10.

*f. Border, Title and Legend Overlay.*

**2–34. Mobilization Development Utility and Storm Drainage Plans.** Show the changes to and required trunklines necessary for each utility to support the mobilization development. Each plan consists of the following overlays:

*a. Base Map Overlay.* Use the Base Map Overlay prepared for the Existing Conditions Site Map.

*b. Future Development Overlay.* Use the Future Development Overlay prepared for the Future Development Site Plan.

*c. Mobilization Development Overlay.*

*d. Existing Utility Data Overlay.* Use the Utility Data Overlay from the respective Existing Conditions Utility or Storm Drainage Map.

*e. Mobilization Utility and Existing not to be Retained Overlay.* Prepare an overlay for each utility or for the storm drainage system when trunk line changes are required to support the mobilization development. The type of information and level of detail to be shown on each of these overlays is shown on figures B–11 through B–18.

*f. Border, Title and Legend Overlay.*

*g. Topography Overlay.* This overlay is required for the Storm Drainage Plan and is optional for the water and wastewater plans. Use the Topography Overlay from the Existing Conditions Site Map.

# CHAPTER 3
# OVERLAY PREPARATION

## SECTION I. FORMAT

**3–1. General.** Overlays can be prepared by either the manual or computer-aided drafting method. Manual and computer-aided drafting techniques include ink drafting on transparent film (film positive) and engraved lines on opaque film (negative engraved). Regardless of the method or technique used, overlays should conform to the requirements of map format, legend symbols, registration, and graphic quality control. Careful consideration of the information to be shown on the overlays is also essential to produce high quality composite maps.

**3–2. Map Format.** Overlays will be prepared on sheets of film measuring 28 inches by 40 inches between trim lines. Provide margins outside the trim lines for registration. Map border lines will be 27 inches by 38 inches as illustrated in figure C–7. The limits of the map image will depend upon the chosen map scale and grid system. Orient the map image so that north is at the top of the map. Locate the grid system marks immediately inside the map image as illustrated in figure C–8. If a small area of the installation will not fit within the map image, an insert may be used to show the remainder of the installation. The insert should be oriented in the same direction as the map image and match lines should be labeled.

*a. Key map.* When the installation must be sectionalized onto several sheets, a key map will be drawn as illustrated in figure B–8, to identify the relationship of each sheet to the total installation or built-up area.

(1) Draw a simple outline of the total installation or built-up area showing prominent roads.

(2) Draw the limits of coverage of all sheets superimposed on (1) above. Identify the sheet number on each sheet.

(3) Draw a heavy outline around the limits of coverage which that sheet represents.

*b. Legend.* Locate legend information on the right-hand side above the title block. Some maps and plans, such as the Regional Map, will have one legend column. Others, such as the Site Plan, will have three columns of symbols as illustrated in figure B–8. Align symbols from the various overlays to appear as one legend as illustrated in figure C–7. Only those symbols used on the map need to be included in the legend. Allow space at the bottom of each legend for the addition of legend items during updates.

(1) Existing Conditions Maps will have one legend column entitled "EXISTING" and the two left-hand columns will be omitted.

(2) Future Development Plans will have all three legend columns:

| | | |
|---|---|---|
| "EXISTING NOT TO BE RETAINED" | "PROPOSED" | "EXISTING" |

(3) The Mobilization Development Site Plan will have three legend columns:

| | | |
|---|---|---|
| "PROPOSED MOBILIZATION CONSTRUCTION" | "PROPOSED PERMANENT CONSTRUCTION" | "EXISTING" |

Legends for the remaining Mobilization Development Plans will have three legend columns:

| | | |
|---|---|---|
| "PROPOSED MOBILIZATION CONSTRUCTION" | "EXISTING NOT TO BE RETAINED" | "EXISTING" |

*c. Graphic scale and north arrow.* The graphic scale will be located immediately above the title block in U.S. customary units as illustrated in figure C–7. The graphic scale for the Range and Training Area Map will be in both metric and U.S. customary units. Place the north arrow immediately above the graphic scale.

*d. Notes.* An area below the legend will be designated for notes. Ensure consistent margins and letter sizes between notes appearing on more than one overlay. Coordination between overlays is necessary to avoid overlap and duplication of information. Required notes are stated in chapter 2 and figures B–1 through B–19.

*e. Title block.* One of two title block formats will be used. Title Block A, as illustrated in figure C–9, will be used when an architect/engineer office and a U.S. Army Corps of Engineers District are responsible for preparation and supervision, respectively. Title Block B, as illustrated in figure C–10, will be used when the office of preparation and supervision is the same. The date will establish the accuracy of all information shown on the map. New map information after that date should be incorporated during the next map update. The map preparation is a continual, iterative process.

**3–3. Legend Symbols.**

*a. Legend symbols in Appendix B illustrate the type of information and the degree of detail required on all overlays.* An installation's needs for

information must be depicted in the simplest way to ensure that maps are easy to read and economical to produce. Use the symbols shown when applicable. If additional information must be shown, use recognized symbols to prevent misinterpretation. Additional information may require explanatory notes. Overlays prepared using symbols shown in previous editions of TB ENG 353 need not be revised to change symbols until the overlay is replaced.

*b.* Only those symbols and abbreviations used on the overlay will be shown in the legend. Legends and legend information shown in Appendix B will appear above the title block. Screening of legend symbols will be accomplished during composite production. The symbols will be full strength on the appropriate overlay.

**3–4. Registration.** Registration is the key to quality composite maps. One of three registration techniques will be used as illustrated in figure 3–1.

*a. Pin registration.* Pin registration consists of punching holes in the overlay film outside the trim line at prescribed locations. Overlays are layered on top of one another with prepunched holes fitted over registration pins. Pin registration of overlays shall be used for the production of precise final composite maps without blurred images. Two techniques of pin registration are applicable:

(1) Pin-bar registration using a 26 1/2–inch bar with seven 1/4–inch diameter pins spaced at 4 1/4 inches on center across the top of the sheet.

(2) Individual-pin registration using three individual 1/4–inch diameter registration pins, two along one side and one along the top of the overlay.

(3) The pin-bar registration technique is preferred to provide compatibility with the private reprographic industry. The location of registration holes outside the trim line will be standardized within an office, preventing multiple, confusing registration holes. A system of prepunching all overlays *with the eventual right-reading side up* is mandatory. Standardized hole punches capable of punching all holes simultaneously within 0.003–inch accuracy are required.

*b. Cross-mark registration.* Registration with cross-marks may also be used. The overlays will be marked outside the trim lines near each of the four corners with cross-marks as illustrated in figure 3–1. Cross-marks must be perfectly matched for subsequent combination of overlays to produce a satisfactory composite.

**3–5. Graphic Quality Control.**

*a. Line widths and letter sizes will conform to table D–1.* Letter height will be a minimum of 60–thousandths inches to be readable at half-size reduction. Use figure D–1 as a guide for selection of letter sizes that will be readable at reduced sizes. Updated information will uniformly match existing line widths, letter heights, and symbolism already on the overlay.

*b. Ink lettering and line work will be uniform.* Positive images will be fully opaque when exposed to bright light. The light intensity used during composite production requires fully opaque images on the overlay. Follow recommendations of film manufacturer concerning types of ink to use and techniques for removal of images. Do not use etching inks or any liquids that etch the film.

*c. Negative engraving will be accomplished on a light table with cutting needles and blades of the prescribed line widths.* Line work will be of consistent width and sharpness. All line work to be corrected will be covered with opaque fluid and be completely opaque.

## SECTION II. FILM POSITIVE TECHNIQUE

**3–6 General.** Film positive overlay preparation entails the placement of the desired image on a stable-base film. Overlays may be prepared by any or all of these techniques:

—Pen-and-ink drafting on stable-base film.
—Photographic reproduction of a positive stable base film from an existing original.
—Affixing lettering to a stable-base film by means of varitype, lettering machine, or type stickup.
—Computer-aided drafting on stable-base film.

**3–7. Stable-Base Film.**

*a. Film Properties.*

(1) Stable-base film will not be less than 0.003–inches or more than 0.005–inches thick. Film will have a matte surface on both sides receptive to liquid ink adherence. Surface must permit even application of ink without spreading. Ink images must be removable without leaving ghost images. Surfaces must be capable of several additions and removals of ink on the same area. The film must have a strong and flexible base which resists cracking or tearing. Creasing or sharp and rapid flexing must be avoided. Creasing will interfere with a composite production.

(2) Maximum stability is essential for accurate composites. The permanent expansion coeffi-

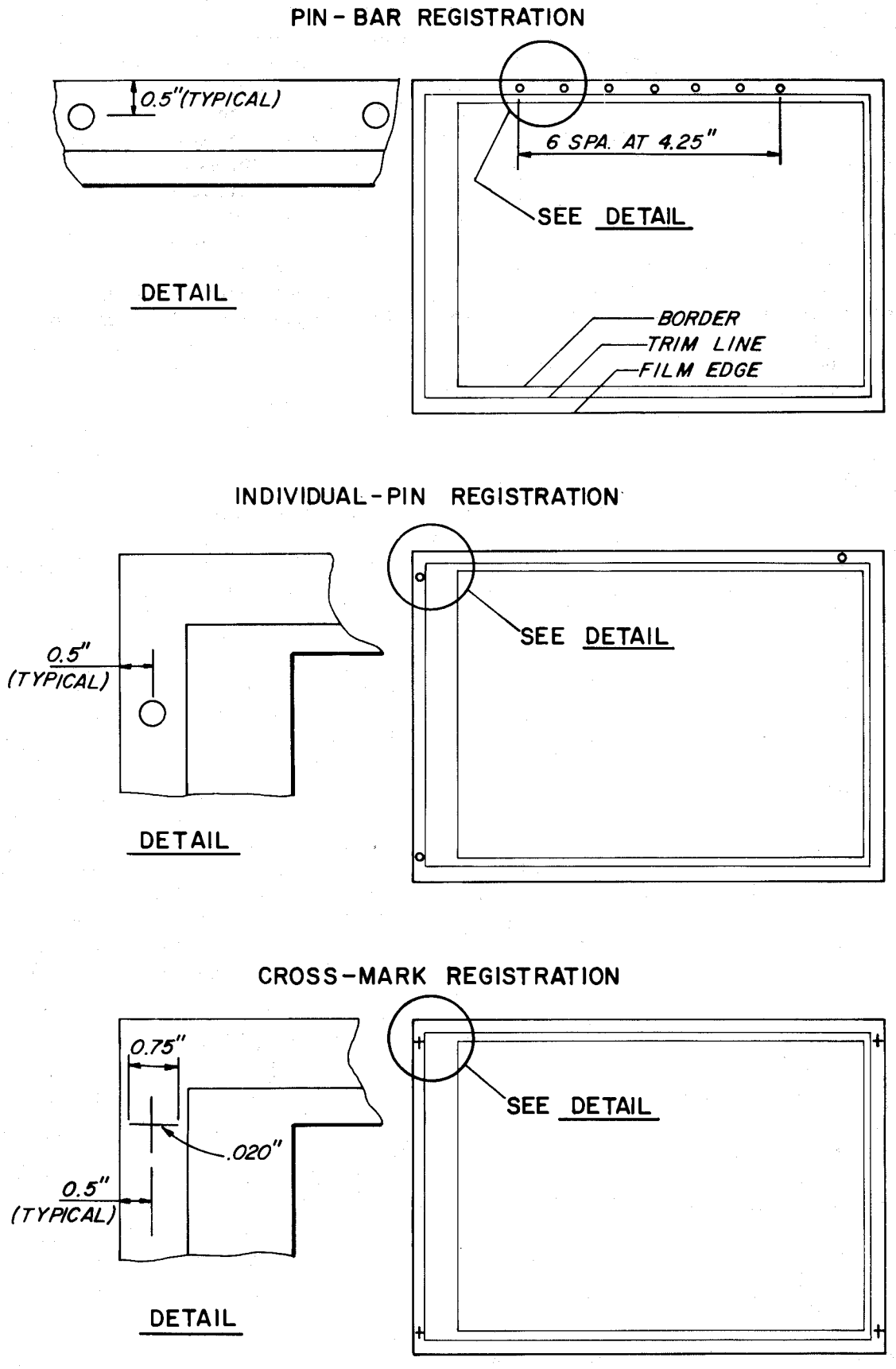



*Figure 3–1. Registration techniques.*

cient of stable-base film should not exceed either 9.52 by $10^{-8}$ inches per inch per degree of temperature change on the Fahrenheit scale or $1.29 \times 10^{-7}$ inches per inch per percent of change in relative humidity. Care must be used in handling the film, as stable-base film is subject to physical deformation by stretching. Temporary deformation has been suspected in certain instances in roll film. Roll film should be cut from the roll 24 hours before use to allow the film to return to normal length. Both sheet and roll film should be moved to the work area 24 hours prior to drafting to allow the film to stabilize.

(3) Normal reproduction at high temperature will not damage or deteriorate the stable-base film. Avoid heating stable-base film above 150 degrees Fahrenheit for sustained periods.

*b. Film types.*

(1) *Unsensitized film:* film without any light sensitive emulsion. It is used for pen-and-ink original overlays.

(2) *Direct positive film:* film with a light sensitive emulsion which permits a positive reproduction in a photographic laboratory from a positive original without an intermediate film negative. Information on a positive original can be transferred to an overlay without the expense of redrafting.

(3) *Photo-positive film:* film with a light sensitive emulsion which permits a positive reproduction in a photographic laboratory from an intermediate film negative. Information on a positive or negative original can be transferred to an overlay without the expense of redrafting.

*c. Film Storage.* Completed film positive overlays must be stored flat. Overlays with automated or type stickup lettering should be covered with paper to prevent the lettering from adhering to other overlays placed on top. Storage areas should be clean and free from dust.

**3–8. Lettering.**

*a. Mechanical lettering.* Mechanical lettering is recommended for most film positive overlays as the clarity is maintained over time. It can be easily matched when overlays are updated. The disadvantages are that the density of the characters may vary. Use the "Leroy Standard Lettering Guide" letter style or its equivalent for all mechanical lettering.

*b. Typed lettering.* When a large quantity of lettering is required, it may be advantageous to produce lettering either by varityper, stick-on lettering, or type stickup techniques. Each technique has its strengths and weaknesses. In rough handling, type-stickup and stick-on lettering are more likely to chip or flake, but both techniques are quicker and offer a consistently dense image with good reproduction qualities. These disadvantages can be overcome by producing the required film positive overlay with one of these lettering techniques and reproducing the overlay in a photographic laboratory.

(1) *Type size.* Type sizes are designated by a point system. There are approximately 72 points per inch. Letter heights specified in table D–1 can be converted to the point system. Consult type suppliers concerning actual sizes of various characters available.

(2) *Type style.* Type style is the basic design of the letters and numerals. The News Gothic style of lettering is fairly bold, with block-type characters approximating the type style of mechanical lettering. This style should be used in map preparation.

(3) *Varityper.* A varityper is designed especially for composing copy on engineering tracings. The machine provides a continuous writing line of some 20 inches and has an open-end carriage that does not limit the size of the overlay inserted into the machine.

(4) *Stick-on lettering.* Lettering machines produce lettering with adhesive backing in one continuous line with proper spacing between words such that a complete line can be stuck onto the film positive. Guide lines, parallel bars, or other means should be employed ensuring all lettering is level before the lettering is pressed firmly in place.

(5) *Type stickup.* This process starts with type production by one of several techniques; i.e., stick-on lettering, phototypesetter, press-on type, or typewriter. Once the desired layout has been created, the type is offset printed on "peel and stick" acetate. The type is cut out and applied to the film positive in the proper position and alignment.

(6) *Fixatives.* Added permanence of all three lettering techniques can be gained through the use of a spray fixative. The fixative prevents chipping of letters and curling of adhesive backing. Fixatives should be applied to the lettering only; mask the remaining overlay image.

## SECTION III. NEGATIVE ENGRAVED TECHNIQUES

**3–9. General.** Negative engraved overlay preparation entails the placement of the desired image on a negative engraved film material. Overlays may be negative engraved by any or all of these techniques:

—Engraving lines and symbols on a scribe film with scribing tools (depicting features directly on a negative).

—Photo-chemical reproduction of a negative film (reproscribe) from an existing negative original.
—Diazo reproduction of a negative film from an existing positive original. The reproduced lines and symbols are used as guidelines for engraving.

**3–10. Negative Engraved Film.**

*a. Scribe film properties.* Scribe film consist of a transparent stable-base film covered with an opaque emulsion. When the emulsion is engraved, the transparent lines and symbols produced allow light to pass through during photographic reproductions. The remaining emulsion blocks out light.

(1) *Base material.* The transparent base material of scribe films must have the same stability characteristics as specified above. The minimum thickness suitable for the preparation of overlays is 0.0075 inches. Scribe film materials must never be bent sharply since such treatment will result in permanent deformation of the base material. The base material must be transparent to allow the unimpeded transmission of light for photographic exposures after engraving. The base material requires a fine matte surface on the emulsion side and a polished surface on the nonemulsion side. Roll film must be cut from the roll 48 hours before use to allow the film to return to normal length.

(2) *Emulsion.* The opaque emulsion must have the necessary properties to provide a clean line with sharp distinct edges when engraved. It must adhere to the base material and be stabilized to preclude any detectable change in line width. The emulsion must be sufficiently hard to prevent scarring, but be pliable enough to allow engraving without using excessive pressure. The emulsion should be receptive to opaquing fluids and must not be damaged by these materials. It must be suitable for soft pencil drafting without scarring. It should be actinically opaque, since the engraved overlay will be used as a negative during composite production.

*b. Reproscribe properties.* This film must have the same properties as scribe film, plus emulsion properties providing photographic exposure and chemical etching for reproducing line work from an existing *negative original.* The etched lines must be sharp, clear, and equal in width to those on the negative original. There should be no evidence of feathering. The emulsion must be such that additional engraving operations may be conducted. Line work should be equal in all respects to engraved line work on scribe film.

*c. Diazo scribe film properties.* Diazo scribe film consist of a transparent stable-base film covered with an opaque light-sensitive emulsion. It must have the same properties as scribe film, plus emulsion properties providing photographic exposure and reproduction of line work from an existing *positive original.* Line work is developed by an Ozalid machine. The reproduced line work is engraved as described in paragraph *a.* above.

*d. Film storage.* Completed negative engraved overlays must be covered on the emulsion side with paper or thin acetate and stored flat. Storage areas should be clean and free from dust.

**3–11. Blockout.** Blockout is a masking technique of covering engraved lines, symbols, or lettering on negative engraved film or photographic negatives. It prevents photographic reproduction of information. Permanent blockout is accomplished with opaque fluid. Temporary blockout is best accomplished with lithographic tape.

**3–12. Type Application.** Lettered information for negative engraved overlays is prepared on a separate companion film positive overlay as described above. When completed, the type overlay contains all names, textual data, and supplementary information for the symbols and line work shown on the negative engraved overlay.

## SECTION IV. COMPUTER-AIDED DRAFTING METHOD

**3–13. General.**

*a.* Overlays may be prepared by a computer-aided drafting method, generating a map from a database containing the description, location and attributes of map information. Use of this method is not intended to make the manual method of map preparation obsolete. Rather, it enhances the overlay-composite system by providing for the composition of overlays on a computer-controlled plotter, reducing the photocomposition required by the manual method. For example, all overlay information required as *full strength* on the final composite can be computer-plotted on a single overlay. This information may be on several overlays in the manual method as illustrated in figures 2–1, 2–2, and 2–3. All overlay information having the same *screen percentage* can be computer-plotted on a single overlay. This reduces the cost of composite production. Laser plotter equipment can produce *full strength* and *screened* map information in one step, however the cost may be higher than with conventional photocomposition.

*b.* The map format, legend symbols, letter sizes, and composite materials used for computer-aided

drafting should be compatible with the manual method. Letter style for computer-aided drafting should approximate News Gothic. Minor changes to pen- and laser-plotted overlays may be made by the manual method. Corresponding changes must be made to the computer database. Major revisions of computer-plotted overlays containing several layers of information should be replotted. Electrostatically-plotted overlays should be replotted even for minor changes due to the difference in appearance between manual and electrostatically-plotted output.

**3–14. Plotter Characteristics.** Three types of plotters may be used for overlay preparation. They are the pen plotter, electrostatic plotter, and laser plotter. Characteristics of each are:

*a. Pen plotter.*

(1) Properties.

(*a*) The pen plotter is capable of accepting a variety of output media, such as stable-base film, paper, or triacetate. Output media may be preprinted, standard sheets. A variety of pen types are available for these plotters. Examples include liquid ink pens, pressurized ballpoint, and felt tip. Further, most plotters contain a pen bank holding different pen tips. This enables the automatic interchange of line widths or ink colors. The pen plotter is versatile and capable of producing manual quality work.

(*b*) The pen plotter operates by drawing straight lines between points. It plots solid figures by drawing a series of parallel lines, each offset from the previous line by half a line width.

(*c*) As a mechanical device, the pen plotter operates relatively slowly. Furthermore, the time required for generating a single plot increases with the number of lines drawn.

(*d*) Pen plotters are available in three types: flat bed, belt bed, and drum.

(2) Equipment requirements.

(*a*) The flat bed plotter and the belt bed plotter are preferred to a drum plotter for overlay preparation.

(*b*) The plotter must be a minimum of 32 inches wide and must be able to accommodate a plot 42 inches long.

(*c*) The plotters must be capable of accepting liquid ink pen tips and must be capable of producing line densities satisfactory for photographic reproduction.

(*d*) A multiple-pen bank is required, preferably with four or more pens.

(3) Supplies.

(*a*) Plotting will be done on a stable-base film with a black liquid ink. Film properties will be as described above. Film will be compatible with the pen plotter requirements.

(*b*) For line uniformity and continuity, pen tips should be made of tungsten or sapphire, rather than stainless steel. Pen tips widths will be compatible with specified line widths contained in table D–1.

(*c*) The ink will be highly opaque, quick-drying and designed for adhesion to the base film surface.

*b. Electrostatic plotter.*

(1) Properties.

(*a*) The electrostatic plotter requires specially coated output media. These media can be obtained in a variety of base materials; such as stable-base film, vellum, and paper.

(*b*) The electrostatic plotter operates by first coating the treated medium with electrically charged ions and then, with black toner (the fluid used to produce the plot), causing the image to appear. The ionic charges are deposited in a fixed matrix of points, which lie from 0.01 to 0.004 inches apart. Lines of varying widths, as well as solid figures, are plotted as a set of points.

(*c*) An electrostatic plotter generates a complete row of the plot simultaneously. Since it is primarily an electrical device, it operates at very high speeds. The complexity of the plot has no effect on the plotting time but it will affect computer execution time.

(2) Equipment requirements.

(*a*) The plotter must be a minimum of 32 inches wide and must be able to accommodate a plot 42 inches long.

(*b*) The electrostatic plotter point density will equal or exceed 200 points per inch.

(*c*) The electrostatic plotter must be capable of using a stable-base film as a plotting medium.

(3) Supplies. Plotting will be done on a stable-base film, especially coated for use in electrostatic plotters. Film properties will be as described above.

*c. Laser plotter.*

(1) Properties.

(*a*) The laser plotter is capable of accepting either light-sensitive stable-base or negative film. It operates at very high speeds and is capable of producing manual quality work.

(*b*) The laser plotter operates by exposing the laser beam to the light-sensitive film mounted on a drum. Location of the laser beam is controlled by a computer. Lines may be plotted with a density ranging from 16 to 64 lines per millimeter.

(2) Equipment requirements.

(*a*) The plotter must be a minimum of 32 inches wide and must be able to plot 42 inches long.

(*b*) The laser plotter must be capable of

producing line densities satisfactory for photographic reproduction.

(3) Supplies. Plotting will be done on stable-base film with a light-sensitive emulsion for use in laser plotters. Film properties will be as described above.

## SECTION V. COMMON OVERLAYS

**3–15. Title and Index Sheets.**

*a. Title sheet.* Prints of completed composite maps will be covered with a title sheet as illustrated on figure C–1 and bound as a folio. The title sheet will contain the installation name, the state where the installation is located, the installation logo, the preparation date, and the title. For half-size offset printed maps, add the following note:

NOTE

"Drawings in this folio have been reduced to one half the original scale."

*b. Index.* An index of sheets will be prepared as illustrated on figure C–2. The index will contain the title "Index"; the installation name; the state where the installation is located; and a listing of maps by map title, date and sheet number. When the index is short, combine it with the title sheet as illustrated on figure C–3. Adjust the layout for aesthetic balance.

**3–16. Border, Title and Legend Overlay.** Every composite map type, such as the Existing Conditions Site Map or the Future Development Site Plan, will have a separate Border, Title, and Legend Overlay. This overlay will contain the border, title block, scale, north arrow, legend text, map title, and other elements which will be constant for the map being prepared. The advantage of a separate overlay is that all information on this overlay can be used for composite production without time-consuming masking operations. All titles, symbols or notes can be photographed as is, without using block-out to remove screening, color codes or conflicting information. When installations are sectionalized into more than one sheet, a single Border, Title and Legend Overlay will suffice for each type of map. For example, a single overlay will suffice for Existing Conditions Site Map sheets 1 through 6 of 6. The Base Map Overlay should not be combined with the Border, Title and Legend Overlay because different screen intensities are specified for the two overlays.

**3–17. Base Map Overlay.** Preparation of the Base Map Overlay will depend on the source, quality, scale and condition of the original map.

*a.* The Base Map Overlay for small-scale maps and plans prepared by the manual method will normally be prepared as a photographic reproduction of existing maps. If the existing map is a film positive, then a film negative may be prepared and undesired features opaqued or masked to obtain the desired map image and features. The desired map image may comprise parts of several existing maps. In this case, film negatives of each existing map are prepared and spliced together to form one contiguous base map. Either a film positive or a reproscribe will be prepared from the negative and the map image line and grid system will be drafted.

*b.* The Base Map Overlay for the large-scale maps and plans will be drafted from aerial photographic manuscripts. The symbols used on the Base Map should be drafted on the Base Map Overlay adjacent to the appropriate legend text and under the "Existing" column. When more than one sheet is required to cover the building area, the heavy rectangle identifying the key map sheet and the sheet number will be drafted on the Base Map Overlay.

**3–18. Topography Overlay.** Preparation of the Topography Overlay will depend on the source, quality, scale and condition of the original map.

*a.* The Topography Overlay for small-scale maps and plans prepared by the manual method will normally be prepared as a photographic reproduction of existing maps. The existing maps may be either a film positive or a film negative which will be reproduced in similar fashion to the corresponding Base Map Overlay discussed above.

*b.* The Topography Overlay for the large-scale maps and plans prepared by manual methods will normally be drafted on stable-base film from aerial photographic manuscripts. The contour symbols used should be drafted adjacent to the appropriate legend text and under the "Existing" column.

**3–19. Existing to be Retained Overlay.** The Future Development Plans will show existing development to be retained and not to be retained. The means of deleting plan features not to be retained depends on the plan to be prepared.

*a.* On the Future Development Tree Cover, Transportation, Utility and Storm Drainage Plans, all existing features are shown on one overlay at full strength. Cross-marks shown on a separate overlay indicate existing features not to be retained. On the composite maps, existing to be retained features are shown at full strength without cross-marks.

*b.* On the Future Development Site and Range and Training Area Maps, a film negative of the overlay showing existing facilities will be prepared and the existing not to be retained features will be opaqued. The modified negative will be shown at full strength on the composite map.

**3–20. Existing not to be Retained Overlay.** Map features depicting development not to be retained will be screened or shown at full strength depending on the plan to be prepared.

*a.* On the Future Development Tree Cover, Transportation, Utility and Storm Drainage Plans, cross-marks will be used to indicate existing features not to be retained. On the composite map, existing not to be retained features will be crossed out and shown at full strength.

*b.* On the Future Development Site and Range and Training Area Plans, a second film negative of the overlay showing existing facilities will be prepared and all features to be retained will be opaqued. The appropriate symbols for those features not to be retained will be moved from the "Existing" column of the legend and spliced into the film negative in the "Existing not to be Retained" column. The modified negative will be screened on the composite map.

**3–21. Future Development Overlay.** Before the Future Development Overlay from the Future Development Site Plan is used to prepare the Mobilization Development Site Plan, any mobilization projects required prior to M-day that are shown on the overlay must be removed. Prepare a film negative of the overlay and mask the mobilization projects. The modified Future Development Overlay will be screened on the composite map. All required mobilization development will be shown at full strength on the Mobilization Development Overlay.

# CHAPTER 4
# COMPOSITE

**4–1. General.**

*a.* Composite production consists of transfering information from several overlays to one composite map. A full-size film composite is used to prepare Installation Master Plan Maps. A film composite consists of a positive image on stable base film suitable for diazo development of diazo prints.

*b.* Each Installation Master Plan Map requires a specific series of overlays. Information on each overlay may be screened during composite production to allow the most important information to be easily readable. The required overlays and their relative intensity are indicated in the following Overlay-Composite Schedules:

| *Installation Master Plan Map* | *Full-Size Film Composite* |
|---|---|
| Existing Conditions Maps | table 2–1 |
| Future Development Plans | table 2–2 |
| Mobilization Development Plans | table 2–3 |

For example, table 2–1 indicates a full-size film composite of Existing Conditions Site Map requires five overlays: Border, Title and Legend; Base Map; Building Numbers; Environmental/ Safety Restrictions; and Topography. The first three overlays will appear full strength and the Environmental/Safety Restrictions and Topography Overlays will be screened 40 percent of full strength.

**4–2. Screen.**

*a. Screen identification.* Screens are identified by the number of lines of dots per inch, type of dot, the percent of tone (for example, 40 percent) and the angle of dot lines. Screens are made with round, square or elliptical dots. The most desirable screen for map preparation has the round dot pattern. The rows of dots are parallel to each other, and at a stated angle from the vertical position. The percent of tone is a measurement of the estimated area of image coverage on the composite map and equals the proportion of the image that will be covered by the dot pattern.

*b. Forty-five degree angle screen.* A 42 percent tone, 120–line, round dot screen with a 45–degree angle has been used in the past for general work in composite production of Installation Master Plan maps. Visual differences are negligible within two or three percentage points of the 42 percent tone screen. Commercial screens of this type are available in a series from 10 percent to 90 percent in increments of 5 percent.

*c. Biangled screen.* Biangled screens are used for holding a sharper image where fine details such as contours are involved. Biangled screens have rows of dots running at different angles from the vertical position. For example, a screen has a dot row at 45 degrees and 75 degrees from the vertical. Line spacing may vary from coarse to fine.

*d. Applications.* For best results, a biangled screen is recommended for detailed overlays such as Topography or Base Map. Either a 45–degree angle or a biangled screen can be used for less detailed overlays. For composites with a single screen tone, either a 40–42 percent tone, 120–line, round dot screen with a 45–degree angle or a 40 percent tone, biangled screen is recommended. For composites requiring more than one screen tone, adequate contrast is provided using both 40–42 percent and 16 percent tone screens. For half-size offset-printed composites, the screen should be applied to overlays at the reduced size. The same screens recommended for full-size composites are recommended for half-size composites.

**4–3. Film composite.**

*a. Techniques.* Film composites can be prepared from either film positive overlays, negative engraved overlays, or computer-aided drafting overlays. Film positive and computer-aided drafting overlays must be photographed and a film negative developed for use during film composite production. Negative engraved overlays are used as is. There are two techniques of film composite production of Installation Master Plan Maps:

(1) *Contact photographic technique.* This technique consists of exposing an undeveloped film positive to a light source while in contact with one full-size film negative or negative engraved overlay. The first overlay is removed, the second is placed in contact with the undeveloped film and exposed to the light source. Exposures continue until all overlays are processed.

(2) *Photographic projection technique.* This technique consists of projecting light from behind one reduced-size film negative of each overlay through a camera lens to an undeveloped film positive. The first reduced-size negative is removed and the second positioned for projection of light to the undeveloped film. Exposures continue until all reduced-size overlays are processed. This technique is not applicable to negative engraved overlays.

*b. Quality control.* The contact photographic

technique provides the best image clarity and registration of overlays. The photographic projection technique allows substantial savings of film negative material.

(1) *Overlays.* Once all overlays necessary for a final composite are completed and registered to one another, they should be checked to ensure that all legend symbols appear in the appropriate location and that all title block information has been completed.

(2) *Registration.* Pin registration of film negatives is essential to accurate composites.

(3) *Screen.* A screen should be positioned in contact with the undeveloped film positive, with the emulsion side of the screen towards the film. The screen should be positioned to cover only those features to be screened.

(4) *Exposure time.* Exposure time of the undeveloped film is critical. All exposures must take into account the narrowest lines and the smallest lettering, while not overexposing bolder images.

(5) *Reduced-size negative.* The best results are obtained using larger size films such as 20 inch by 24 inch.

(6) *Reverse reading.* All composites should be reverse reading for obtaining the clearest diazo prints.

(7) *Matte surface.* Composites will have a matte surface on both sides suitable for pen and ink drafting.

**4–4. Revisions.** Revisions to completed film composites should be limited to minor changes. A revision record should be kept on final composite films indicating date and description of revision. Revisions should be simultaneously made to the original overlays so that when a composite is reprocessed it will be current. If the screened information is to be revised, reprocessing of a new film composite will be necessary.

# APPENDIX A
# REFERENCES

## Government Publications.

*Departments of the Army and the Air Force.*

| | |
|---|---|
| AR 200–1 | Environmental Protection and Enhancement. |
| AR 210–20 | Master Planning for Army Installations. |
| AR 420–74 | Natural Resources—Land, Forest and Wildlife Management. |
| FM 11–486–5 | Telecommunications Engineering Outside Plant Telephone. |
| TM 5–330 | Planning and Design of Roads, Airbases, and Heliports in the Theatre of Operations. |
| TM 5–630 | Natural Resources Land Management. |
| TM 5–803–1 | Installation Master Planning. |
| TM 5–803–4 | Planning of Army Aviation Facilities. |
| TM 5–803–5 | Installation Design. |
| TM 5–803–7/ AFR 86–14 | Civil Engineering Programming: Airfield and Heliport Planning Criteria. |
| TM 5–823–4 | Marking of Army Airfield-Heliport Operational and Maintenance Facilities |

# APPENDIX B
# INSTALLATION MASTER PLAN MAP PREPARATION LEGEND SYMBOLS

## LEGEND SYMBOLS

## REGIONAL

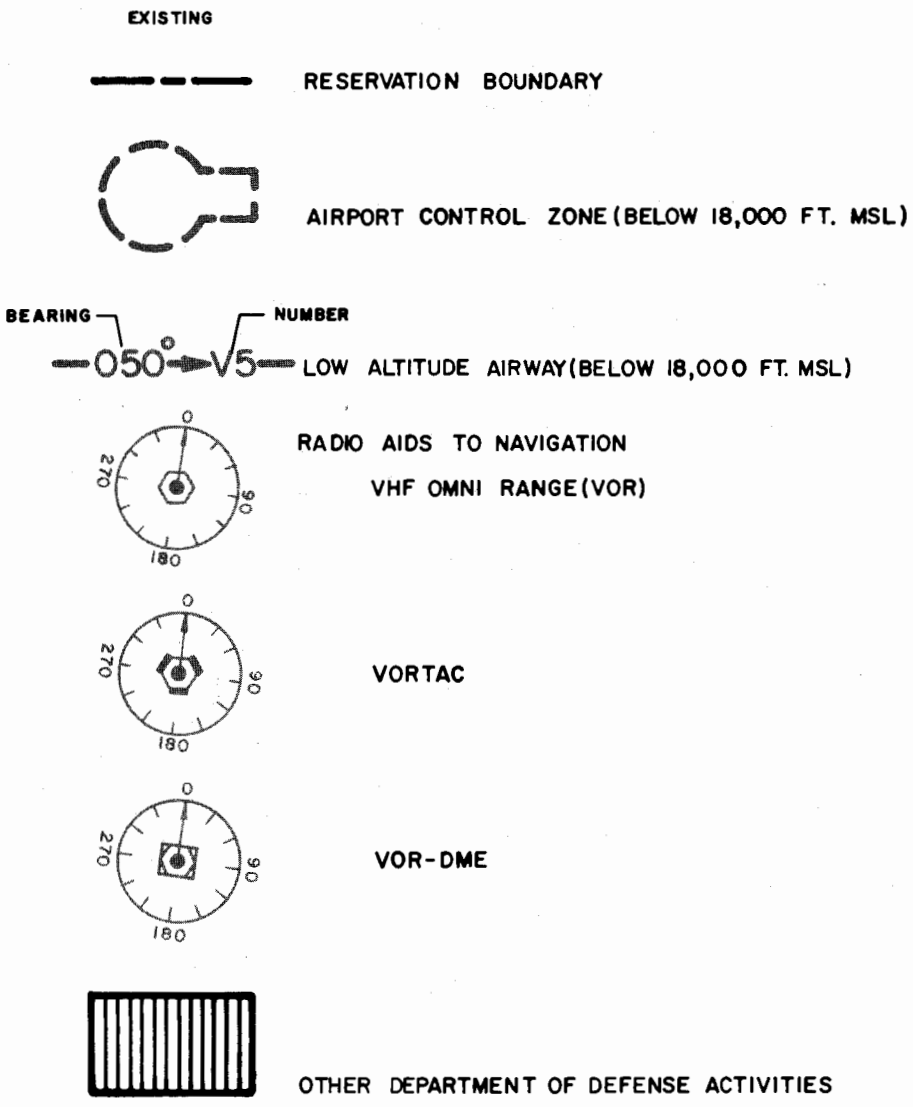


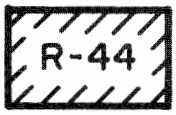

*Figure B–1. Regional area.*

## LEGEND SYMBOLS

# REGIONAL
(CONT.)

## LEGEND

EXISTING




PROHIBITED, RESTRICTED, WARNING OR ALERT AIRSPACE


MILITARY OPERATIONS AIRSPACE

---

## SHEET INFORMATION

*NOTES:* 1. *Base map symbols shall be as presented on USGS quadrangle maps excluding contours and woodlands.*

2. *Aeronautical data shall be as presented on NOAA aeronautical charts.*

3. *Label on the map image, the installation name and other DOD activities.*

*Figure B–1. Regional area—Continued.*

LEGEND SYMBOLS

# AIRSPACE SURFACES

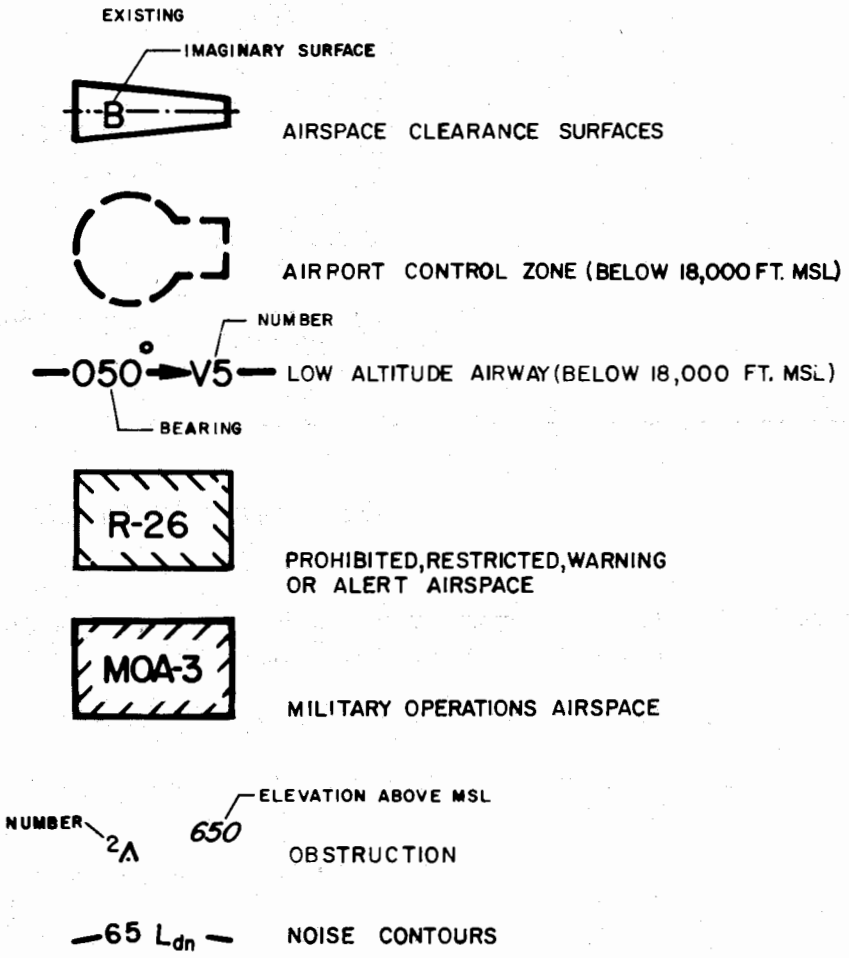



*Figure B–2. Airspace surfaces.*

## LEGEND SYMBOLS
# AIRSPACE SURFACES
## (CONT.)

### LEGEND INFORMATION

FIXED WING AIRCRAFT
IMAGINARY SURFACES

A = PRIMARY SURFACE
B = CLEAR ZONE SURFACE
C = APPROACH-DEPARTURE CLEARANCE SURFACE (SLOPE)
D = APPROACH-DEPARTURE CLEARANCE SURFACE (HORIZONTAL)
E = INNER HORIZONTAL SURFACE
F = CONICAL SURFACE
G = OUTER HORIZONTAL SURFACE
H = TRANSITIONAL SURFACE

ROTARY WING AIRCRAFT
IMAGINARY SURFACES

A = PRIMARY SURFACE
B = TAKEOFF SAFETY ZONE
C = APPROACH-DEPARTURE CLEARANCE SURFACE
D = APPROACH-DEPARTURE ZONE
E = TRANSITIONAL SURFACE

---

## SHEET INFORMATION

*NOTES:* 1. *Base map symbols shall be as presented on USGS quadrangle maps excluding woodlands.*

2. *Aeronautical data shall be as presented on NOAA aeronautical charts.*

3. *Limits, datum elevations and slope ratios for airspace imaginary surfaces will be labeled on map image (TM 5-803-4 and TM 5-803-7).*

4. *Tabulate "Air Navigation Obstructions", as shown and in accordance with TM 5-803-04.*

AIR NAVIGATION OBSTRUCTIONS

| NUMBER | DESCRIPTION | TOP ELEVATION | HEIGHT ABOVE GROUND | HEIGHT ABOVE IMAGINARY SURFACE |
|---|---|---|---|---|
| 1 | TREES | 611' | 55' | 10' |

5. *Tabulate "Waivers of Navigation Criteria" as shown.*

| NUMBER | EFFECTIVE DATE | DURATION |
|---|---|---|
| 1 | 26 JUNE 1980 | 5 YEARS |

*Figure B–2. Airspace surfaces—Continued.*

LEGEND SYMBOLS

# AIRFIELD APPROACH-DEPARTURE

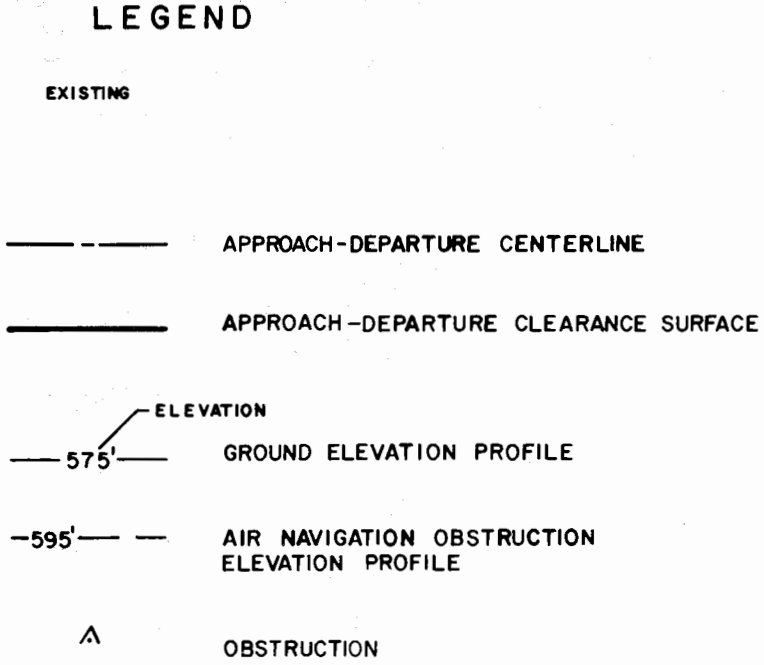



*Figure B–3. Airfield approach-departure.*

LEGEND SYMBOLS

# LAND USE

LEGEND

| | |
|---|---|
| AIR | AIRFIELD |
| MNT | MAINTENANCE |
| IND | INDUSTRIAL |
| S/S | SUPPLY/STORAGE |
| ADM | ADMINISTRATION |
| TRG | TRAINING/RANGES |
| TH | TROOP HOUSING |
| FH | FAMILY HOUSING |
| CF | COMMUNITY FACILITIES |
| MED | MEDICAL |
| REC | OUTDOOR RECREATION |
| OS | OPEN SPACE |

## SHEET INFORMATION

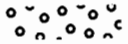
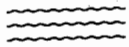
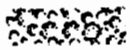
*NOTE:* 1. *Depending on the scale of the map, show primary and secondary roads as black lines wide enough to be readable at half size.*

2. *Adjacent land use patterns should abut each other without overlap or a boundary line.*

*Figure B–4. Land use.*

## STANDARD LAND USE CATEGORIES AND CODING SYSTEM

*Land use areas normally are outlined and labeled as shown on the previous page. They also may be shown in graphic patterns, color outlines, or solid colors as illustrated below.*

| Descriptive Title | Graphic Pattern | Letraset Pattern* Number | Color Code | Prismacolor* Pencil No. | Chartpak Ad* Marker No. | Pantone Color |
|---|---|---|---|---|---|---|
| Airfield |  | LT 129 | Light Blue | 919 | P 104 | 306U |
| Maintenance |  | LT 917 | Dark Gray | 936 | P 188 | 430U |
| Industrial |  | LT 151 | Purple | 931 | P 91 | 259U |
| Supply/Storage |  | LT 106 | Brown | 944 | P 59 | 180U |
| Administration |  | LT 922 | Dark Blue | 906 | P 10 | 301U |
| Training/ Ranges |  | LT 929 | Medium Blue | 903 | P 15 | 299U |
| Troop Housing |  | LT 113 | Yellow Ochre | 942 | P 46 | 124U |
| Family Housing |  | LT 167 | Yellow | 915 | P 41 | Yellow U |
| Community Facilities |  | LT 78 | Orange | 918 | P 150 | 151U |
| Medical |  | LT 122 | Pink | 929 | P 161 | 190U |
| Outdoor Recreation |  | LT 368 | Light Green | 910 | P 28 | 352U |
| Open Space |  | LT 139 | Dark Green | 909 | P 26 | 356U |

* Or equivalent.

*Figure B–4. Land use—Continued.*

LEGEND SYMBOLS

# DEVELOPMENT CONSTRAINTS

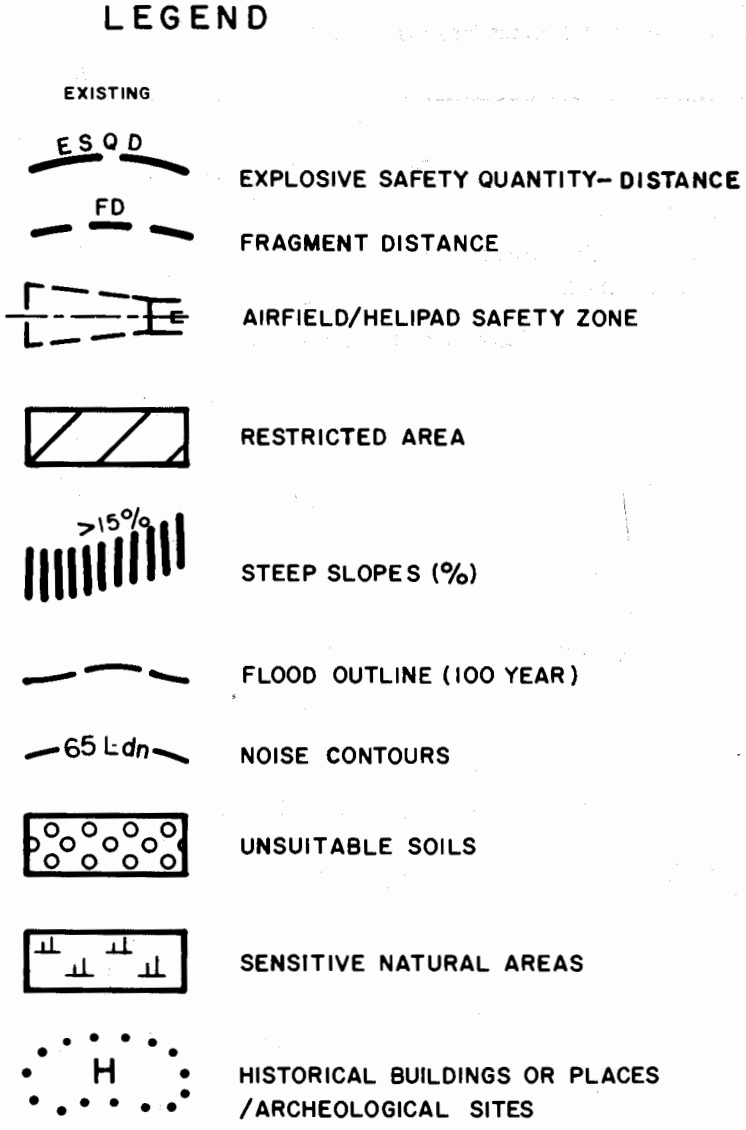



*Figure B–5. Development constraints.*

LEGEND SYMBOLS

# DEVELOPMENT CONSTRAINTS
(CONT.)

LEGEND INFORMATION

**Add the following notes below Legend when applicable**

"NO PORTION OF THE AREA COVERED BY THIS SHEET LIES WITHIN THE 100 YEAR FLOODPLAIN."

"NO KNOWN HISTORICAL PLACES OR ARCHEOLOGICAL SITES ARE LOCATED IN THE AREA COVERED BY THIS SHEET."

**Identify the source of the noise contour information below Legend.**

---

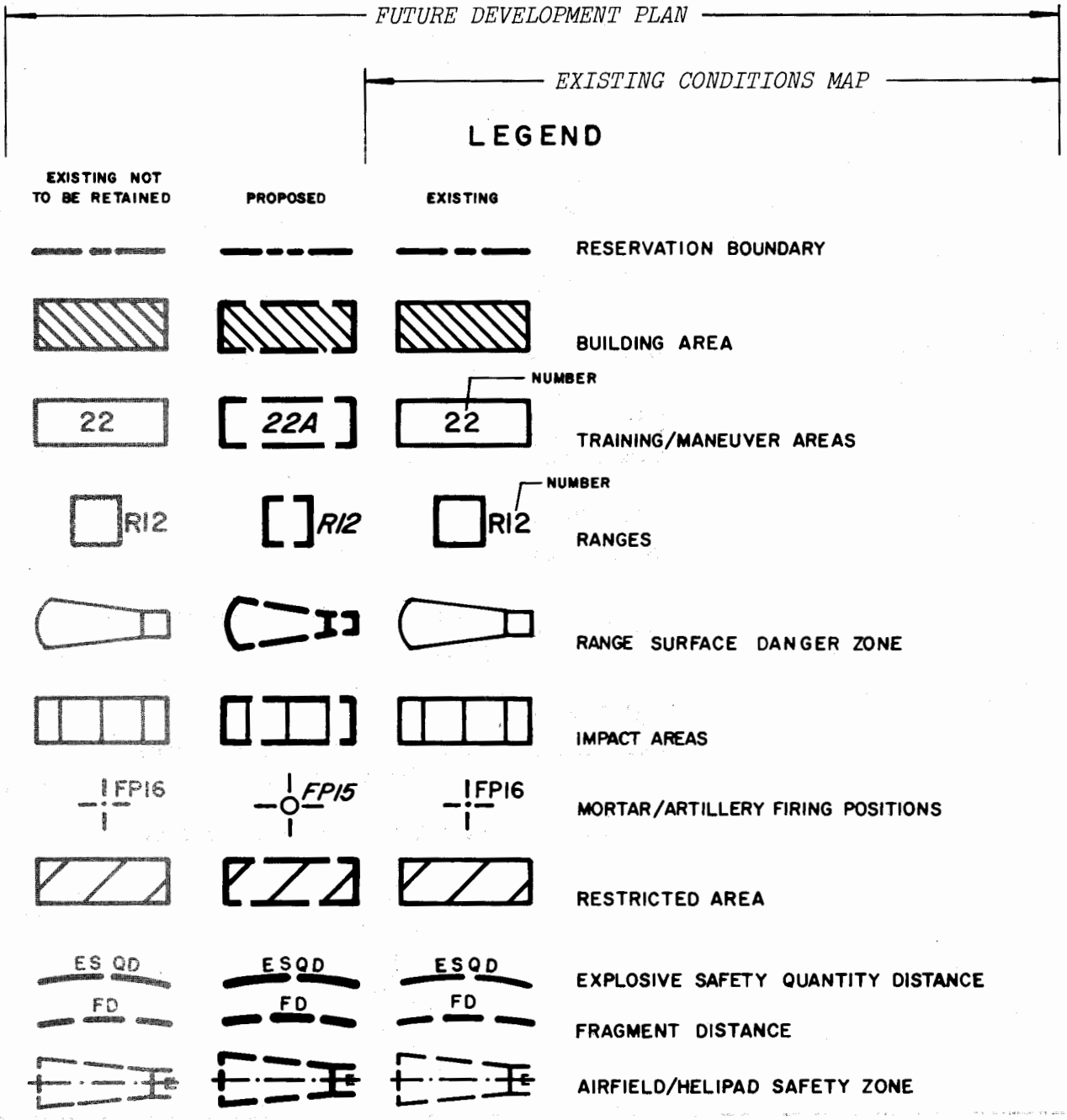
## SHEET INFORMATION

*NOTE: 1. Label on map image the types of restricted areas and sensitive natural areas.*

*Figure B–5. Development constraints—Continued.*

## LEGEND SYMBOLS

# RANGE AND TRAINING AREA




## SHEET INFORMATION

*NOTES:* 1. *Base map symbols shall be as presented on USGS quadrangle maps excluding woodlands.*

2. *Label the reservation boundary, impact areas, and type of restricted area.*

*Figure B–6. Range and training area.*

LEGEND SYMBOLS

# REAL ESTATE

## LEGEND

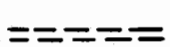
EXISTING



FEE TITLE PROPERTY LINE

IN-LEASE LAND

OUT-LEASE LAND



LAND UNDER LICENSE, PERMIT AND EASEMENT

GOVERNMENT OWNED-CONTRACTOR OPERATED AREAS

MONUMENT, HORIZONTAL CONTROL

## SHEET INFORMATION

*NOTE: 1. Tabulate lessee, lessor, owner of license, permit or easement and government owned-contractor operated (GOCO) areas.*

*Figure B-7. Real estate.*

LEGEND SYMBOLS

# SITE MAP

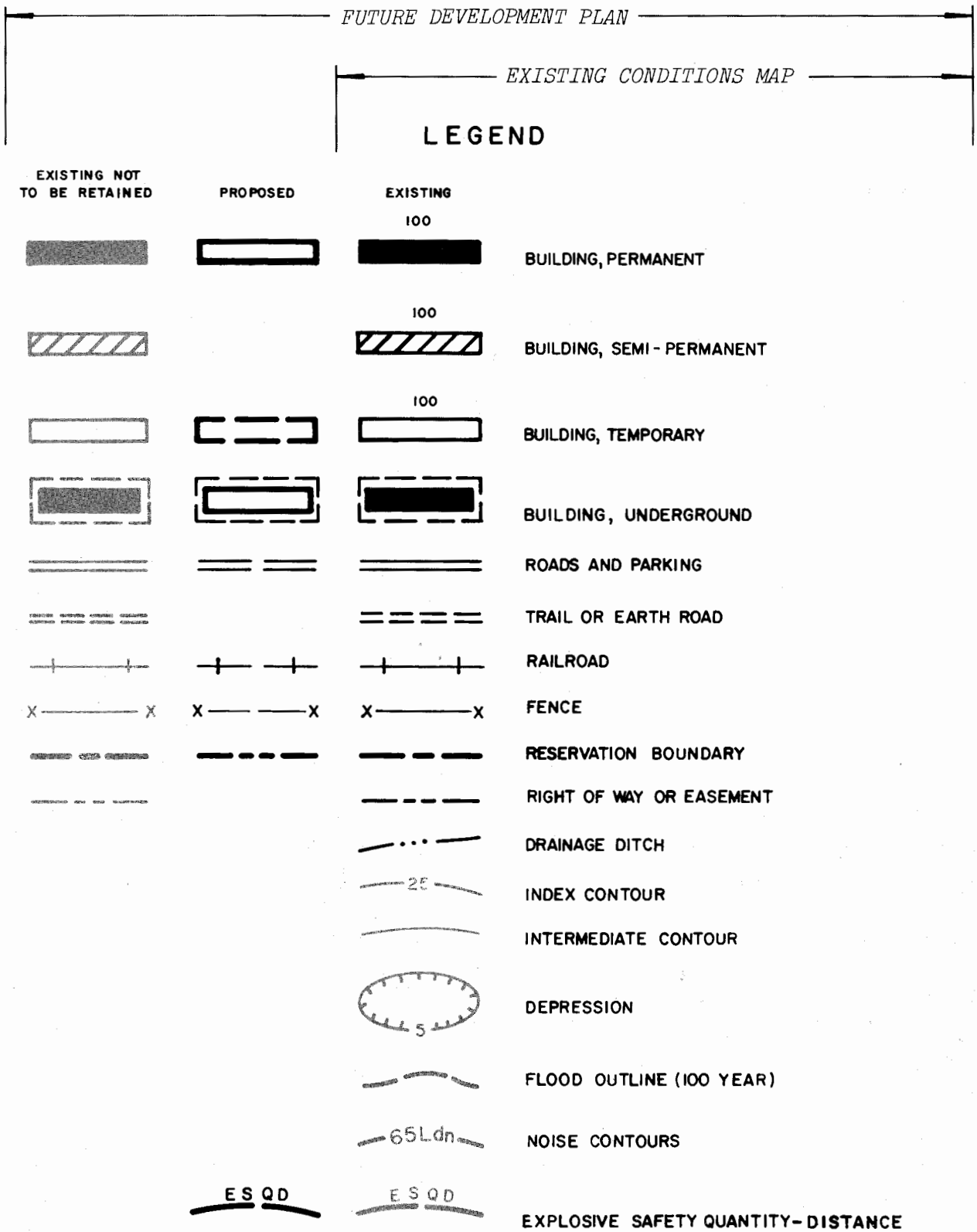
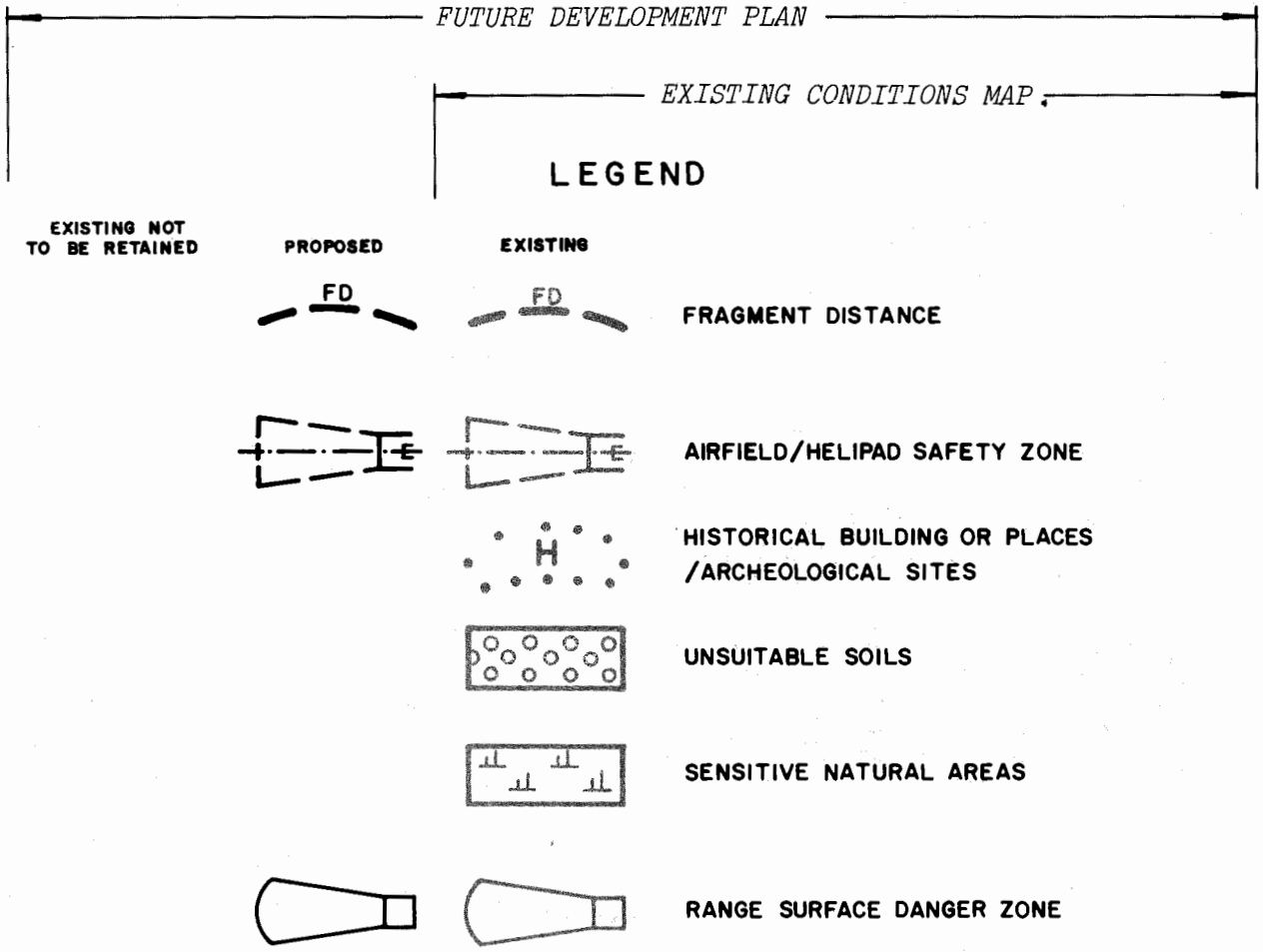



*Figure B–8. Site map.*

## LEGEND SYMBOLS

# SITE MAP
(CONT.)




## LEGEND INFORMATION

Add the following notes below Legend when applicable:

"NO PORTION OF THE AREA COVERED BY THIS SHEET LIES WITHIN THE 100 YEAR FLOODPLAIN."

"NO KNOWN HISTORICAL PLACES OR ARCHEOLOGICAL SITES ARE LOCATED IN THE AREA COVERED BY THIS SHEET."

Above the title block of the Future Development Site Map add the following note:

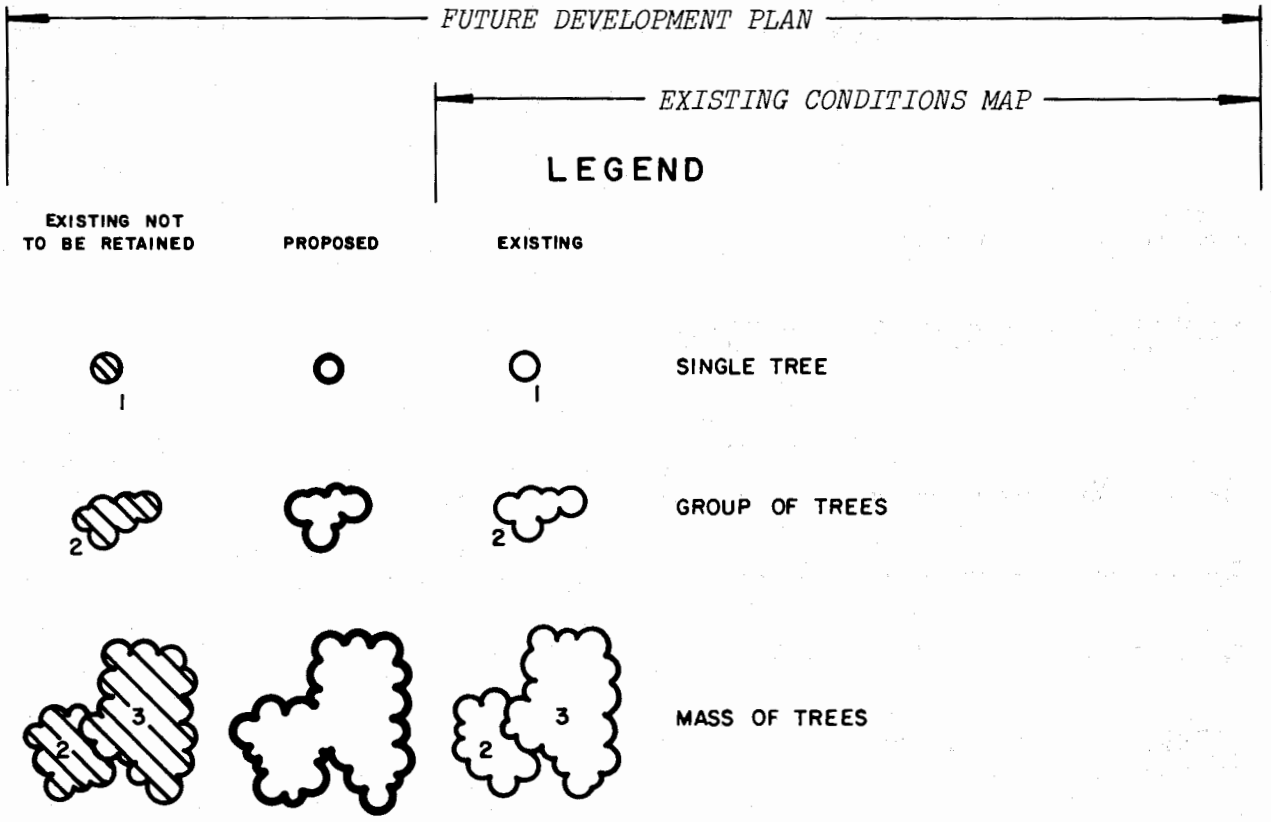
ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, SAFETY, HISTORICAL, ECONOMIC, AND OPERATIONAL LIMITATIONS FOR EACH PROPOSED ITEM.

Signed: _____

DIRECTOR OF ENGINEERING AND HOUSING

*Figure B–8. Site map—Continued.*

## LEGEND SYMBOLS
# TREE COVER




## SHEET INFORMATION

*NOTE: 1. Tabulate species type.*

DOMINENT TREE LIST

| SPECIES TYPE | BOTANICAL NAME | COMMON NAME |
|---|---|---|
| 1 | ACER SACCHARINUM | SILVER MAPLE |
| 2 | QUERCUS PALUSTRUS | PIN OAK |
| 3 | PINUS TAEDA | LOBLOLLY PINE |

*Figure B–9. Tree cover.*

# LEGEND SYMBOLS
# TRANSPORTATION

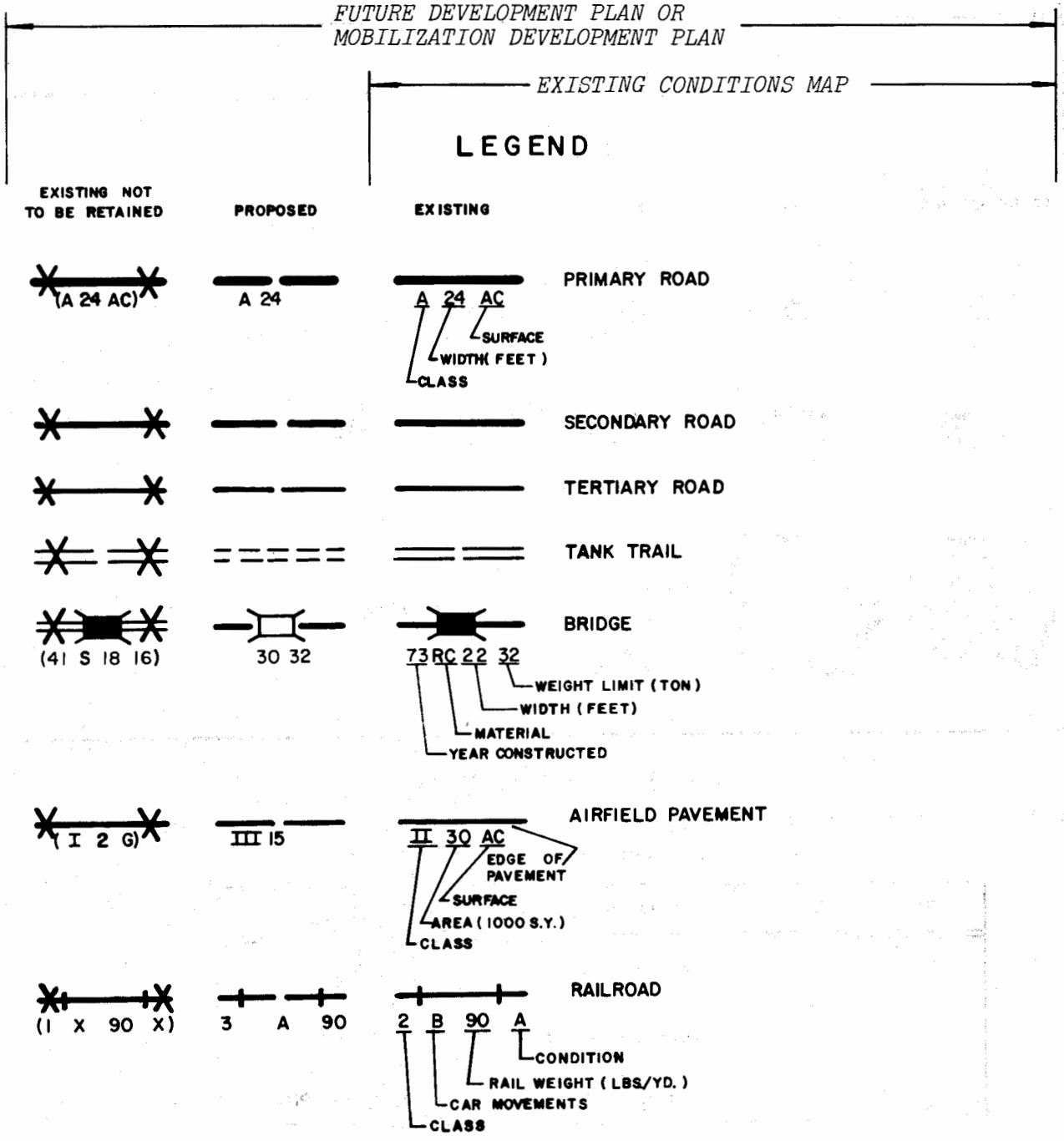
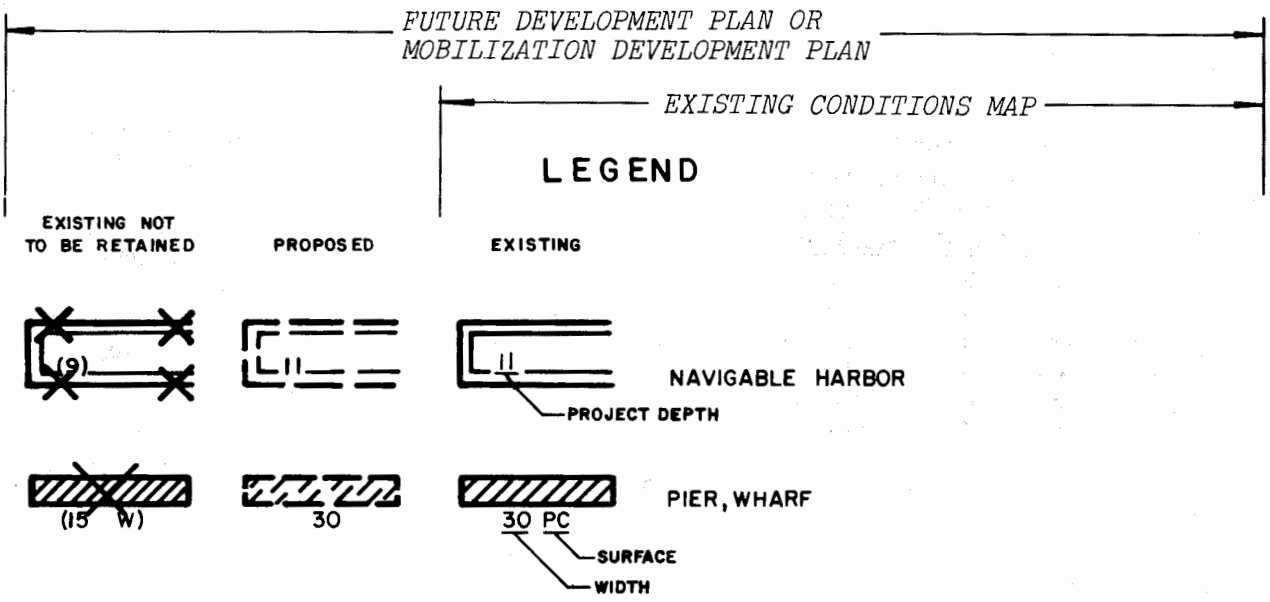



*Figure B–10. Transportation.*

# LEGEND SYMBOLS

# TRANSPORTATION
(CONT.)




## LEGEND INFORMATION

**ROAD CLASS**

A THRU F DEFINED IN TABLE 1 AND 2 (TM 5-822-2). BASE CLASS ON EXISTING OR FUTURE TRAFFIC COMPOSITION.

**SURFACE**

AC = ASPHALTIC CONCRETE
AC/PC = OVERLAY/BASE
BCM = BITUMINOUS COLD MIX
BSA = BITUMINOUS SPRAY APPLICATION
C = CINDERS
D = DIRT (GRADED)
G = GRAVEL
PC = PORTLAND CEMENT CONCRETE
PSP = PIERCED STEEL PLANKING
S = SOD
SC = SAND AND CLAY
U = UNIMPROVED
W = WOOD

**AIRFIELD PAVEMENT CLASS**

I = ROTARY-AND FIXED-WING AIRCRAFT (MAX. GROSS WT. 20,000 lbs. OR LESS)
II = ROTARY-WING AIRCRAFT (MAX. GROSS WT. 20,001 TO 50,000 lbs.)
III = FIXED-WING AIRCRAFT (MAX. GROSS WT. 20,001 TO 175,000 lbs. WITH SPECIFIC GEAR CONFIGURATION, SEE TM 5-803-4)
IV = MULTIPLE WHEEL FIXED-WING AND ROTARY-WING AIRCRAFT OTHER THAN THOSE CONSIDERED FOR CLASS III PAVEMENT

**BRIDGE MATERIALS**

PSC = PRESTRESSED CONCRETE
RC = REINFORCED CONCRETE
S = STEEL BEAM
ST = STEEL TRUSS
W = WOOD

*Figure B–10. Transportation—Continued.*

## LEGEND SYMBOLS

# TRANSPORTATION
(CONT.)

RR TRACK CLASS

| | MAXIMUM ALLOWABLE OPERATING SPEED | |
|---|---|---|
| | FREIGHT | PASSENGER |
| 1 = | 10 | 15 |
| 2 = | 25 | 30 |
| 3 = | 40 | 60 |
| 4 = | 50 | 80 |
| 5 = | 80 | 90 |
| 6 = | 110 | 110 |

RAIL CAR MOVEMENTS PER MONTH

A = 300 OR MORE
B = 100 TO 299
C = 25 TO 99
D = 5 TO 24
E = LESS THAN 5
X = 0

RR TRACK CONDITION

A = EXCELLENT – NO REPAIRS REQUIRED EXCEPT PREVENTATIVE MAINTENANCE.
B = GOOD - RAIL TIES AND BALLAST BASICALLY SATISFACTORY. ONLY MINOR TIE REPLACEMENT, SURFACE CORRECTION AND OTHER TRACK WORK REQUIRED.
C = FAIR – RAILS AND SWITCH POINTS CONSIDERABLY WORN, ABOUT ONE OUT OF FOUR TIES DETERIORATED, BALLAST DIRTY, OR DRAINAGE FACILITIES NEED MAJOR WORK.
D = POOR–UNSAFE, OR SAFE FOR LIGHT AND SLOW TRAFFIC ONLY– HALF OF TIES BAD, FEW OR NO TIE PLATES, DIRTY OR MISSING BALLAST, AND RAIL BADLY WORN.
X = CONDEMNED

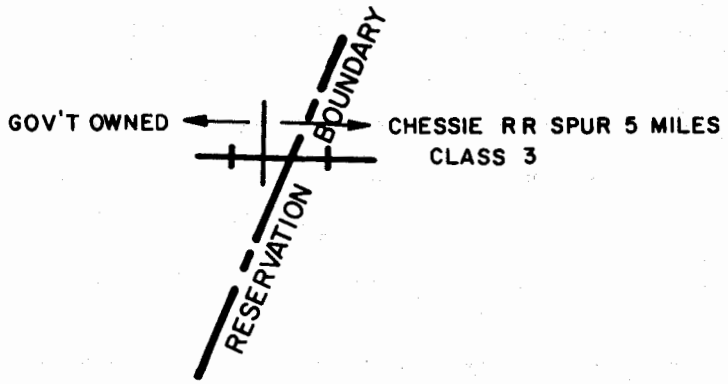
**Add the note below legend "ALL ROADS CAN BE CLOSED TO THE PUBLIC" when applicable.**

*Figure B–10. Transportation—Continued.*

# LEGEND SYMBOLS
# TRANSPORTATION
## (CONT.)

## SHEET INFORMATION

*NOTES:* 1. *Identify railroad ownership as shown:*




2. *For parking areas and hardstands, identify surface only.*

3. *Do not identify the surface of proposed roads.*

4. *For existing transportation items not to be retained, add parentheses around the existing information symbols.*

5. *Road width is either equal the distance face-to-face between curbs or the width of surface or the width of graded roadbed; as applicable.*

6. *For airfield pavement, division lines are shown between different pavement classes.*

7. *Do not identify the condition of proposed railroads.*

8. *Tabulate the road maintenance agreements with other agencies.*

*Figure B–10. Transportation—Continued.*

# LEGEND SYMBOLS
# WATER

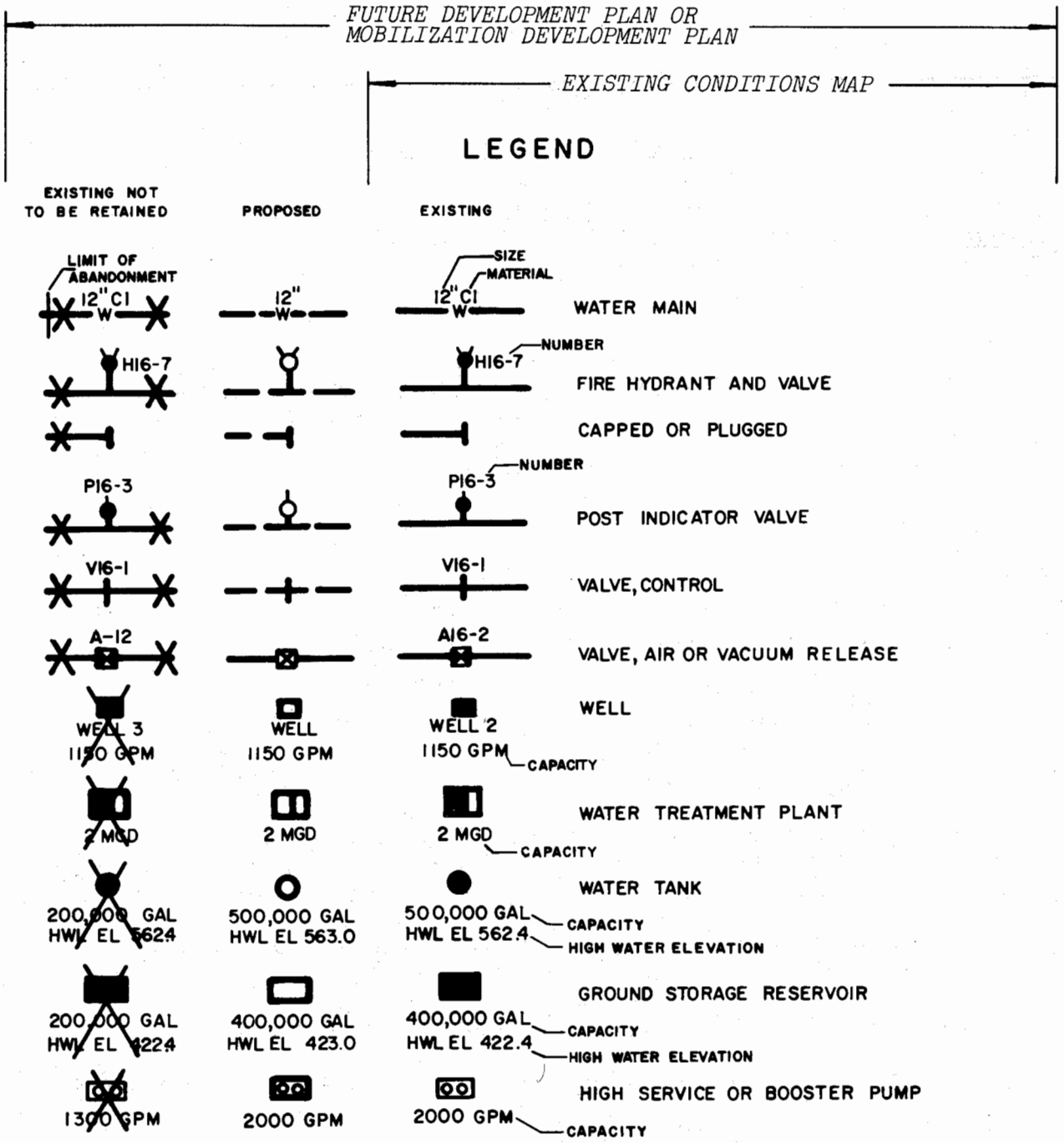



*Figure B–11. Water supply.*

# LEGEND SYMBOLS

# WATER
(CONT.)

## LEGEND INFORMATION

MATERIALS OF CONSTRUCTION

ABS- ACRLONITRILE BUTADIENE STYRENE
AC- ASBESTOS CEMENT
BI - BLACK IRON
CI - CAST IRON
CU - COPPER
DI - DUCTILE IRON
FRP- FIBERGLASS REINFORCED PLASTIC
G GALVANIZED IRON
GS - GALVANIZED STEEL
GWI - GALVANIZED WROUGHT IRON
PVC- POLYVINYL CHLORINE
SW - STEEL WRAPPED
WD - WOOD
WI - WROUGHT IRON

ABBREVIATIONS

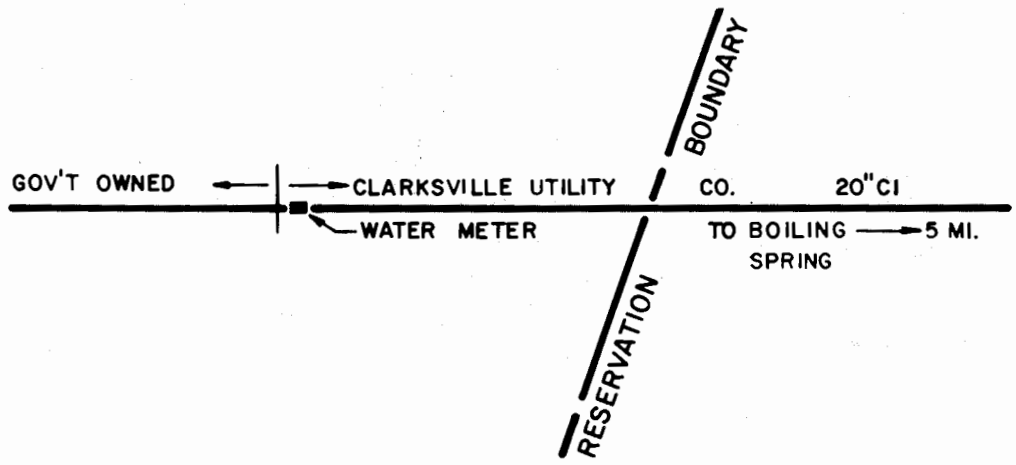
W = POTABLE WATER
IW = INDUSTRIAL WATER
WPS= WET PIPE SPRINKLER SYSTEM
DPS= DRY PIPE SPRINKLER SYSTEM
DLG= DELUGE SPRINKLER SYSTEM
HWL= HIGH WATER LEVEL

When one material of construction predominates, add the note below legend "ALL PIPE CAST IRON UNLESS NOTED OTHERWISE.".

---

## SHEET INFORMATION

*NOTES: 1. Identify water system ownership as shown:*




*2. When only one type of system exists, do not identify "W" or "IW" on the water main.*

*3. 'X'ing of individual hydrants and valves need not be done when the main they are connected to is abandoned.*

*Figure B-11. Water supply—Continued.*

# LEGEND SYMBOLS
# WASTEWATER

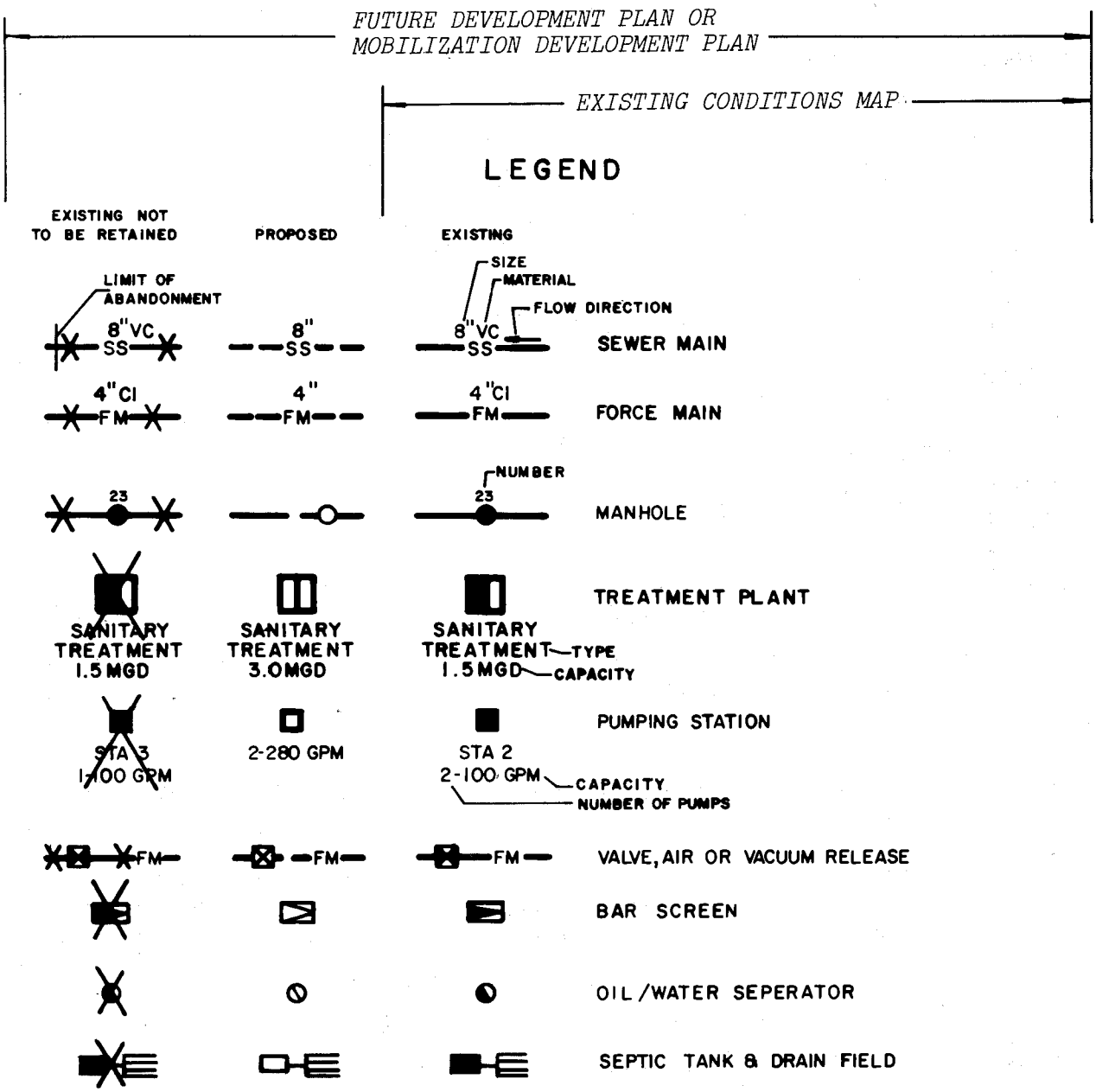



*Figure B–12. Wastewater.*

## LEGEND SYMBOLS

# WASTEWATER

(CONT.)

### LEGEND INFORMATION

MATERIALS OF CONSTRUCTION

| | |
|---|---|
| ABS = ACRLONITRILE BUTADIENE STYRENE | DI = DUCTILE IRON |
| AC = ASBESTOS CEMENT | PVC = POLYVINYL CHLORIDE |
| CI = CAST IRON | RC = REINFORCED CONCRETE |
| CM = CORRUGATED METAL | S = STEEL |
| VC = VITRIFIED CLAY | C = CONCRETE |

ABBREVIATIONS

SS = SANITARY SEWER

IS = INDUSTRIAL SEWER

CS = CONTAMINATED SEWER

When one material of construction predominates, add the note below legend "ALL MAINS SHOWN ARE CAST IRON UNLESS NOTED OTHERWISE ".

---

## SHEET INFORMATION

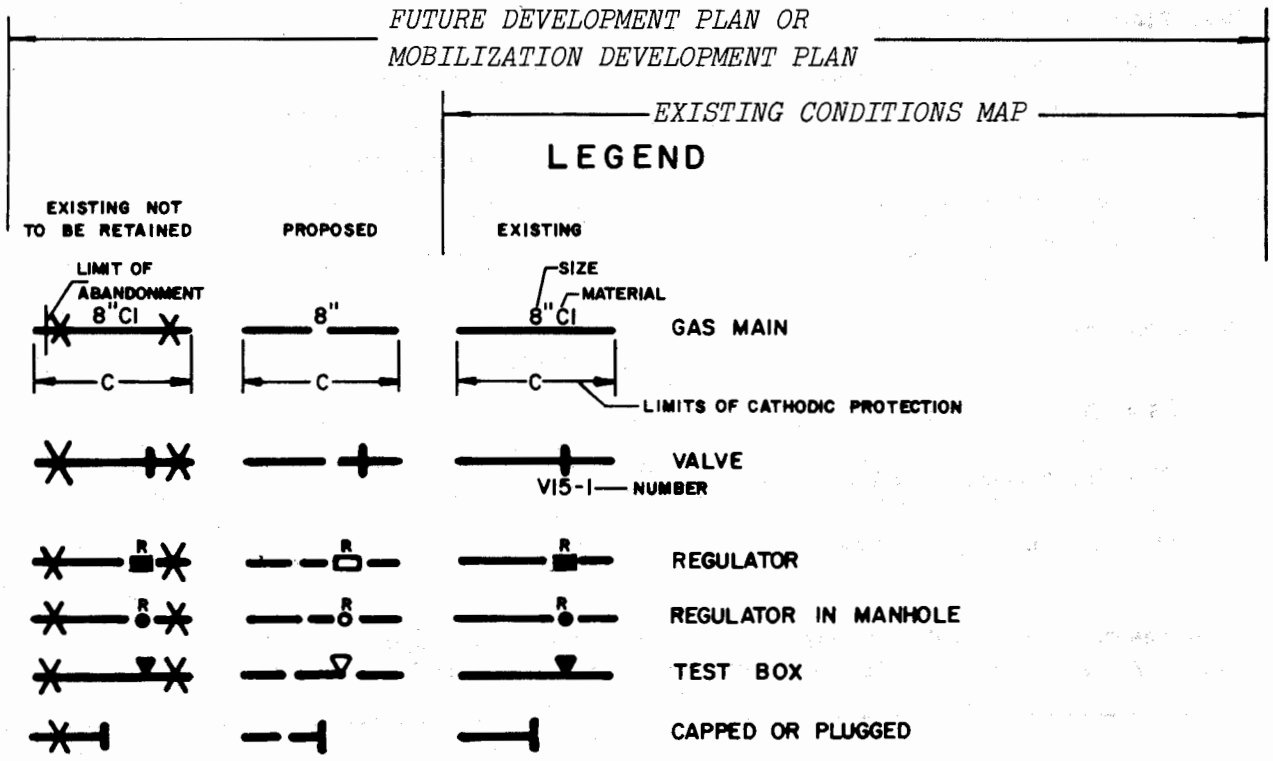
*NOTES:* 1. *When only one type of system exists, do not identify "SS", "IS" or "CS" on the sewer main.*

2. *Invert elevations (inflow-outflow) of manholes may be shown on the map image; otherwise, add a note below the Legend to identify the reference document where these elevations are tabulated.*

3. *Contaminated sewers convey waste streams with high concentrations of toxic chemicals or other contaminants to separate disposal facilities. Such waste streams are unsuitable for normal wastewater treatment processes.*

*Figure B–12. Wastewater—Continued.*

# LEGEND SYMBOLS
# NATURAL GAS




## LEGEND INFORMATION

MATERIALS OF CONSTRUCTION

| | |
|---|---|
| BI - BLACK IRON | PE - POLYETHELENE |
| CI - CAST IRON | S - STEEL |
| GI - GALVANIZED IRON | C&WS- COATED AND WRAPPED STEEL |

When one material of construction predominates, add the note below legend "ALL LINES COATED AND WRAPPED STEEL UNLESS NOTED OTHERWISE".

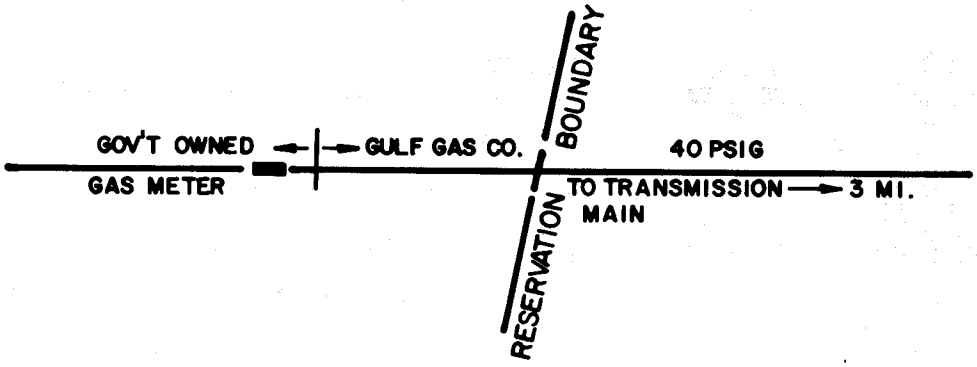
Add the note below the legend to identify the pressure range of the government owned system "GAS MAIN PRESSURES RANGE FROM 12 TO 15 PSIG."

*Figure B–13. Natural gas.*

# LEGEND SYMBOLS
# NATURAL GAS
## ( CONT. )

## SHEET INFORMATION

*NOTES: 1. Identify gas system ownership as shown:*




*2. 'X'ing of individual valves, regulators and test boxes need not be done when the main they are connected to is abandoned.*

*Figure B–13. Natural gas—Continued.*

LEGEND SYMBOLS

# ELECTRICAL

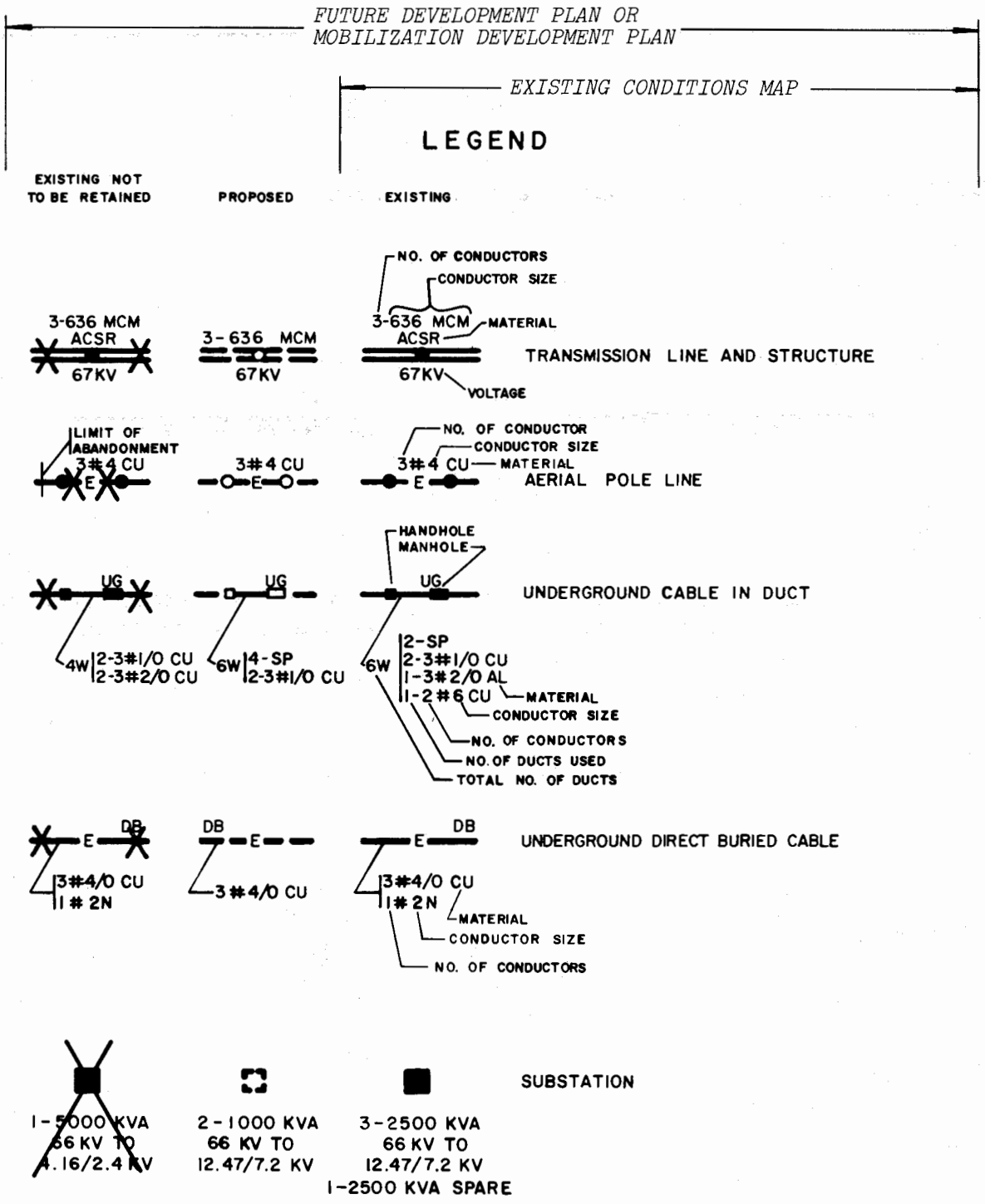



*Figure B–14. Electrical supply.*

## LEGEND SYMBOLS

# ELECTRICAL
(CONT.)

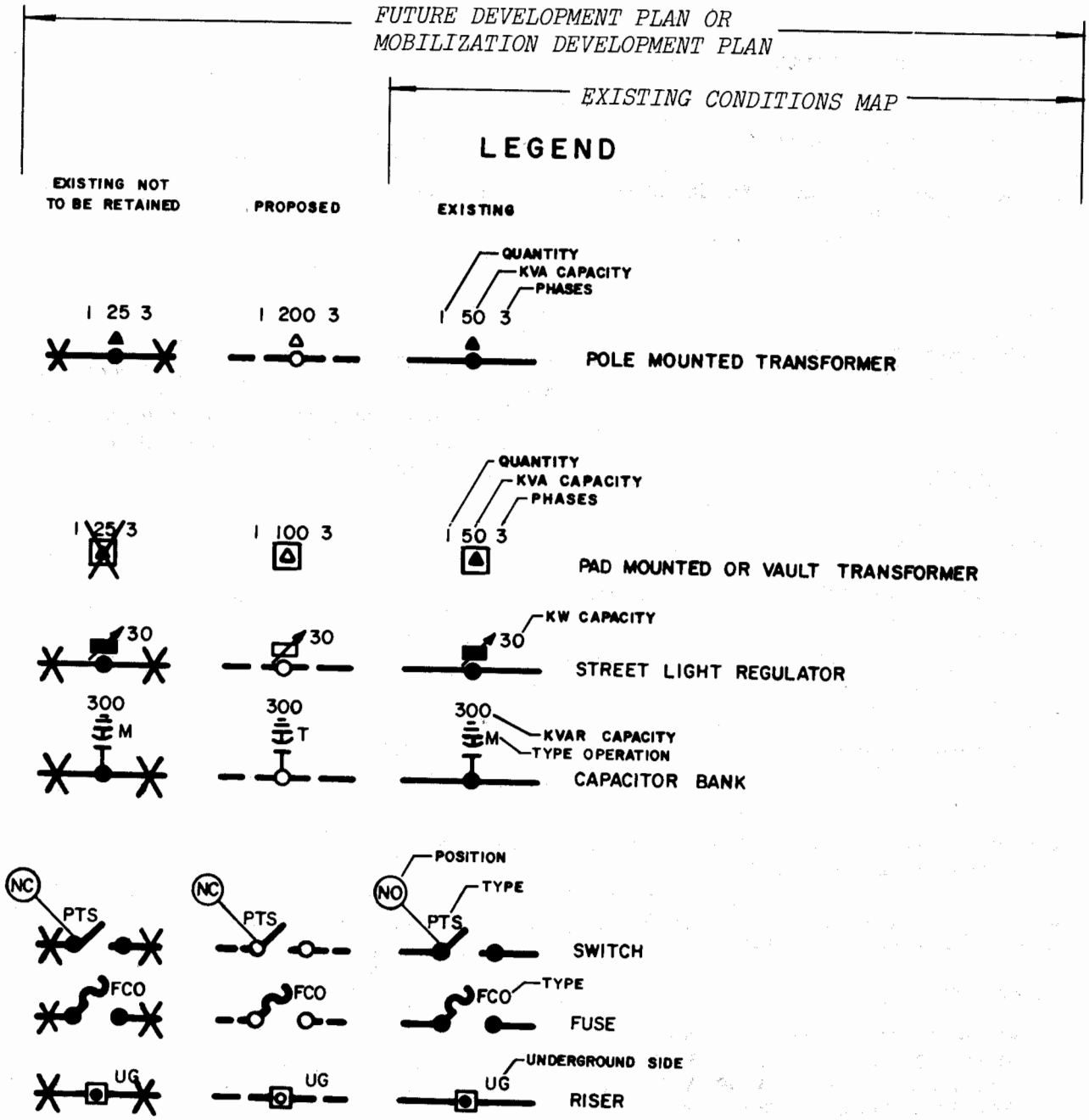



*Figure B–14. Electrical supply—Continued.*

LEGEND SYMBOLS

# ELECTRICAL
(CONT.)

LEGEND INFORMATION

MATERIALS OF CONSTRUCTION·

CONDUCTORS

AAL - ANODIZED ALUMINUM
AL - ALUMINUM
ACSR - ALUMINUM CABLE STEEL REINFORCED
BC - BARE COPPER
BCNW - BARE COPPER NEUTRAL WIRE
CU - COPPER CLAD STEEL
MCM - THOUSAND CIRCULAR MILS
N - NEUTRAL
ST - STEEL STATIC
TB - TRIPLE BRAIDED

DUCT

6W - 6 WAY DUCT LINE
SP - SPARE DUCT

CABLE

CLPI - CROSS-LINKED POLYETHYLENE INSULATED
PILC - PAPER INSULATED LEAD COVERED
RIPJ - RUBBER INSULATED POLYCHLOROPRENE JACKET
VCLC - VARNISHED CAMBRIC LEAD COVERED
WP - WEATHERPROOF INSULATION

SWITCH TYPE & POSITION

PTS - POLE TOP SWITCH
NC - NORMALLY CLOSED
NO - NORMALLY OPEN

FUSE TYPE

AB - AIR BREAK
FCO - FUSED CUT OUT
LBD - LOAD BREAK DISCONNECT
OCB - OIL CIRCUIT BREAKER
SBC - SOLID BLADE CUT OUT

CAPACITOR OPERATION

M - MANUAL SWITCH
T - THERMAL SWITCH

When one material of construction predominates, add the note below legend
"ALL CONDUCTORS BARE COPPER UNLESS NOTED OTHERWISE"

Add the note below legend to identify circuit characteristics for the power company's service and government owned primary distribution.

"CIRCUIT CHARACTERISTICS

POWER COMPANY'S SERVICE 66 KV 3ϕ 3W 60 CYCLES
SERVICE CONDUCTORS - 2 SETS OF 336.4 MCM ACSR
TRANSFORMERS - 1-50 MVA 110 KV TO 43.8 KV
PRIMARY DISTRIBUTION - 12.47/7.2 KV 3ϕ 4W
GROUNDED NEUTRAL"

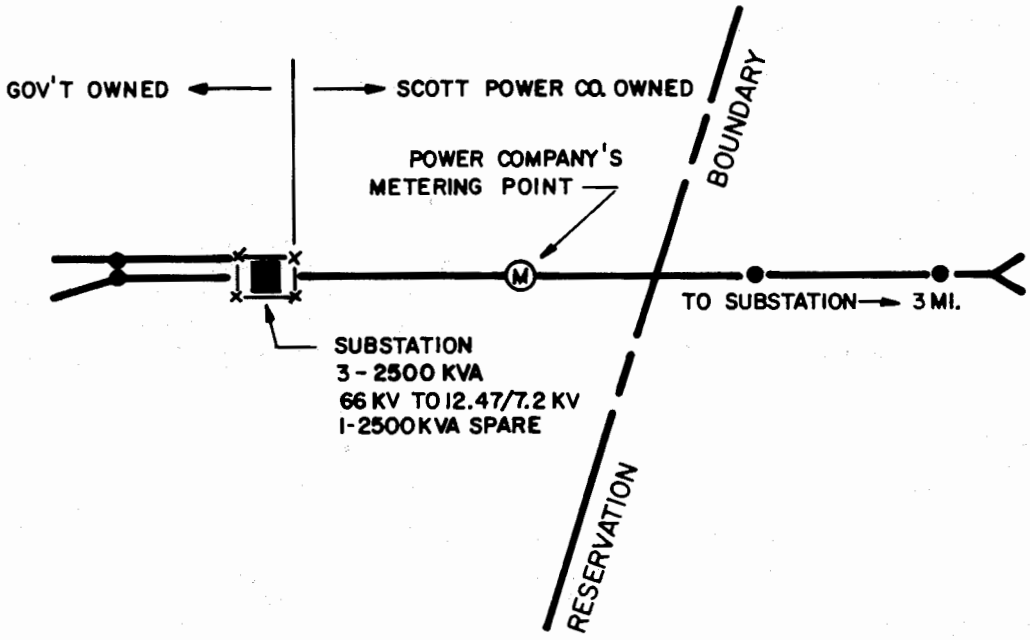
*Figure B-14. Electrical supply—Continued.*

## LEGEND SYMBOLS

# ELECTRICAL
(CONT.)

## SHEET INFORMATION

*NOTES: 1. Identify electrical system ownership as shown:*




*2. Show only primary circuits. Where circuits are of different voltages, identify each with voltage.*

*3. When only one type system exists, do not identify "E" on the electrical line.*

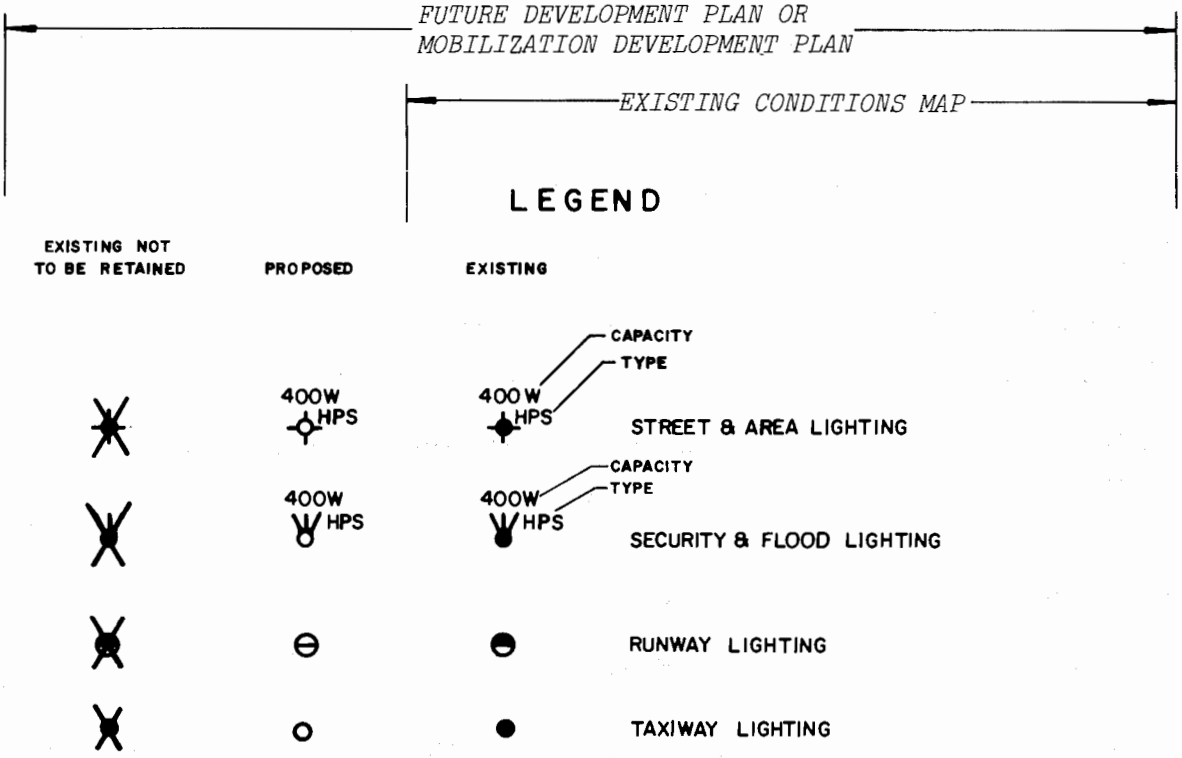
*4. 'X'ing of individual transformers, regulators or capacitors need not be done when the line they are connected to is abandoned.*

*5. The aerial pole symbol represents approximately every fifth pole, and each pole at a branch or turn.*

*6. The substation symbol will be located at the prominent structure.*

*Figure B–14. Electrical supply—Continued.*

## LEGEND SYMBOLS
# LIGHTING




### LEGEND INFORMATION

**TYPE OF CONSTRUCTION**

FL = FLUORESCENT
HPS = HIGH PRESSURE SODIUM
IN = INCANDESCENT
LPS = LOW PRESSURE SODIUM
MH = METAL HALIDE
MV = MERCURY VAPOR
Q = QUARTZ

**ABBREVIATIONS**

HM = HIGH MAST
ML = MULTIPLE LUMINAIRE
OL = OBSTRUCTION LIGHT
W = WATT

**When one material of construction predominates, add the note below legend**
"ALL STREET LIGHTING IS HIGH PRESSURE SODIUM UNLESS NOTED OTHERWISE".

---

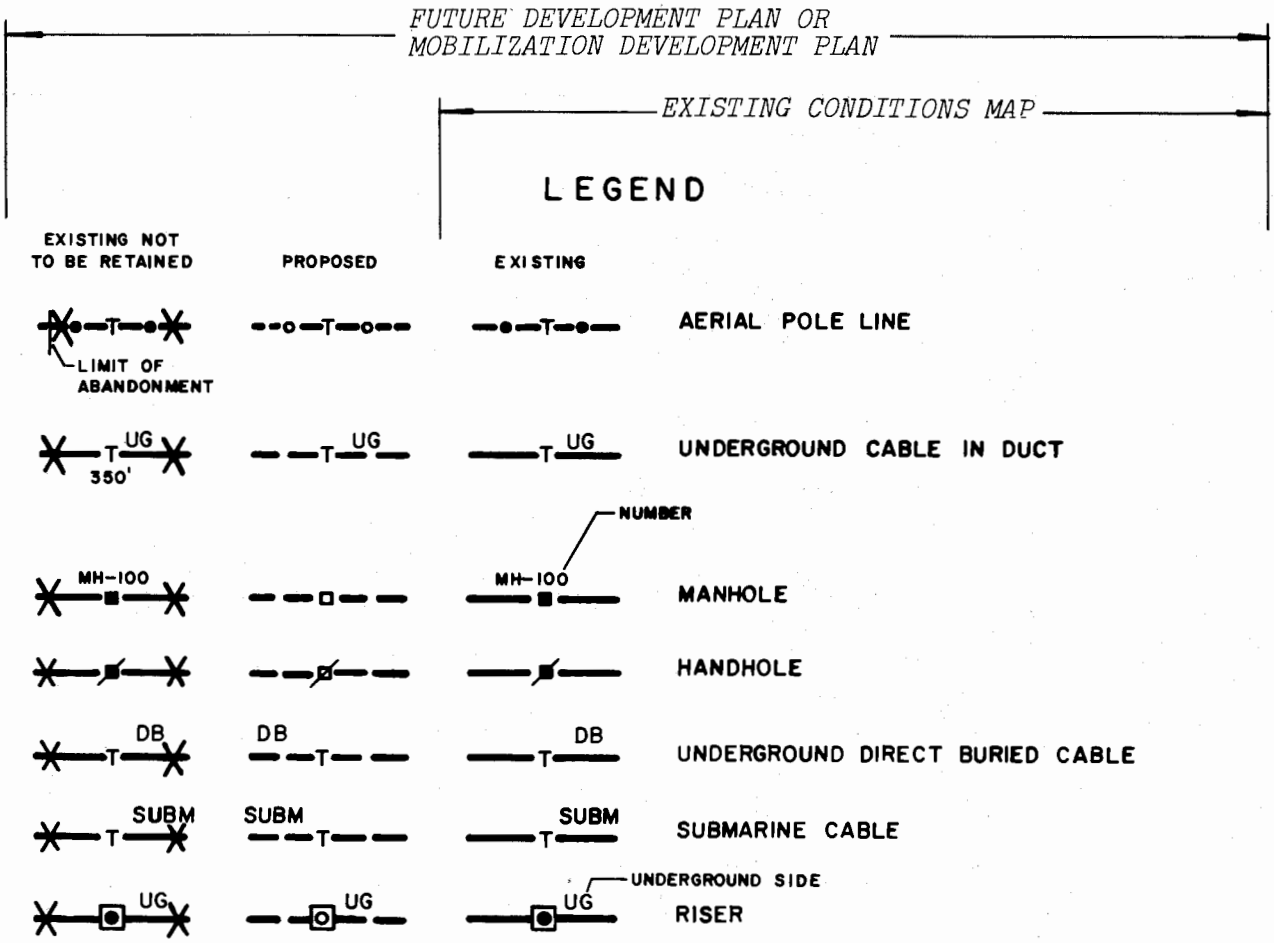
## SHEET INFORMATION

*NOTES: 1. When the same lighting capacities exist throughout an area, add the note on the map image "ALL SECURITY LIGHTING IN AREA (5):400 W HPS".*

*Figure B–15. Lighting.*

## LEGEND SYMBOLS

# TELECOMMUNICATIONS




## LEGEND INFORMATION

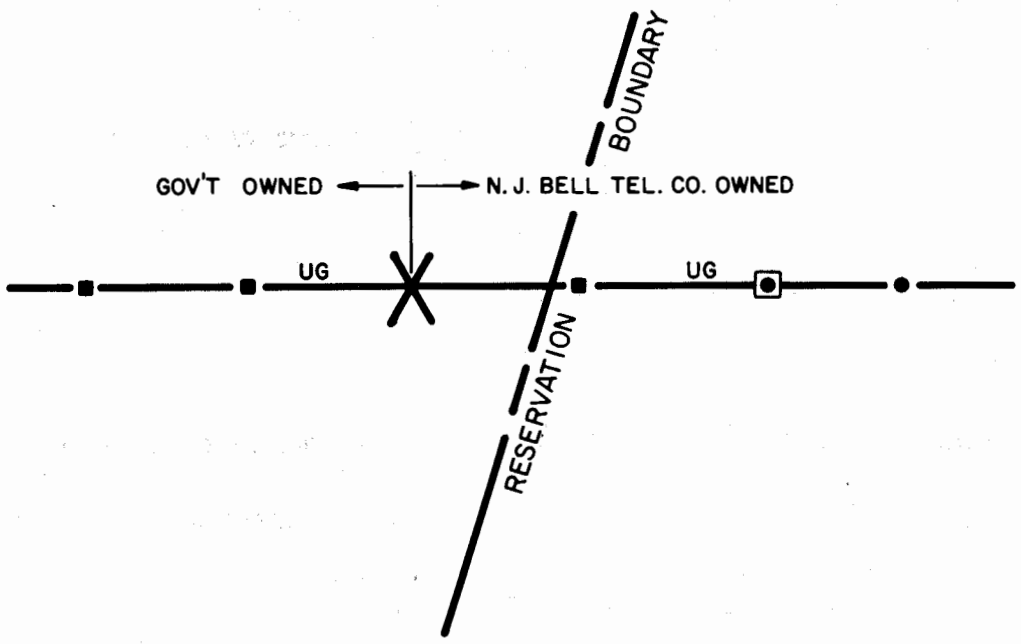
Add the note below the legend to identify that
"INFORMATION ABOUT THE CABLE SIZES, DUCTS, MATERIALS, PAIRS AND TERMINALS CAN BE OBTAINED FROM THE INSTALLATION COMMUNICATIONS/ELECTRONICS OFFICER AND THE INSTALLATION TELECOMMUNICATION PLAN".

*Figure B–16. Telecommunications.*

# LEGEND SYMBOLS
# TELECOMMUNICATIONS
## (CONT.)

## SHEET INFORMATION

*NOTES:* 1. *Identify telecommunications system ownership as shown:*




2. *When only one system exists, do not identify "T" on the telecommunications line.*

3. *Show trunk lines only.*

4. *For the recommended method of numbering telecommuncations manholes, see FM 11-486-5.*

*Figure B-16. Telecommunications—Continued.*

## LEGEND SYMBOLS

# CENTRAL HEATING AND COOLING

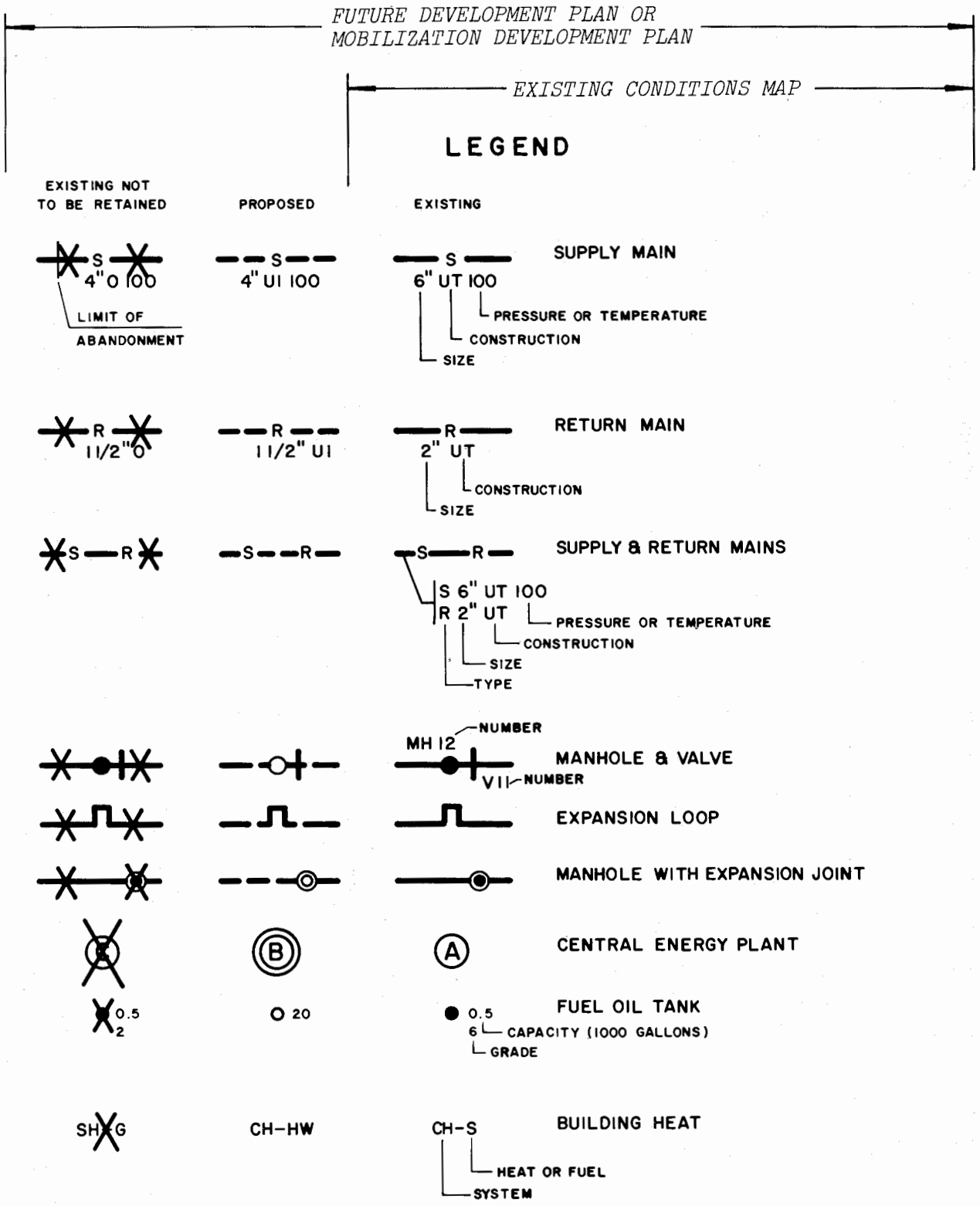



*Figure B–17. Central heating and cooling.*

## LEGEND SYMBOLS

# CENTRAL HEATING AND COOLING (CONT.)

### LEGEND INFORMATION

**TYPE CENTRAL SYSTEM**

S = STEAM SUPPLY
HWS = HIGH TEMPERATURE WATER SUPPLY
CWS = CHILLED WATER SUPPLY
R = STEAM RETURN
HWR = HIGH TEMPERATURE WATER RETURN
CWR = CHILLED WATER RETURN

**TYPE CONSTRUCTION**

C = CONCRETE
I = INSULATING CONCRETE
M = METAL CONDUIT
O = OVERHEAD
T = TUNNEL
U = UNDERGROUND

**TYPE BUILDING HEAT SYSTEM**

CH = CENTRAL HEAT
IH = INDIVIDUAL HEAT
SH = SPACE HEAT

**TYPE HEAT OR FUEL**

S = STEAM
HW = HOT WATER
B = BUTANE
C = COAL
E = ELECTRIC RESISTANCE
EHP = ELECTRIC HEAT PUMP
G = GAS
LP = LIQUID PROPANE
O = OIL
RDF = REFUSE DERIVED FUEL
SL = SOLAR
G/O = DUEL FUEL

---

### SHEET INFORMATION

*NOTES:* 1. *Add the note on the map image to identify the number of boilers or chillers, description and capacity of each, for central energy plants*

*"CENTRAL BOILER PLANT* (A)
*4 TITUSVILLE 3 DRUM WATER TUBE*
*BOILERS 39,000LB STEAM PER*
*HOUR AT 200% RATING EACH"*

2. *When a group of buildings has the same type of heat system and fuel, add the note on the map image "ALL BUILDINGS IN THIS AREA:IH-O".*

3. *Where supply and return mains are parallel, identify both with a single line. Provide information for both supply and return mains.*

*Figure B-17. Central heating and cooling—Continued.*

## LEGEND SYMBOLS
# STORM DRAINAGE

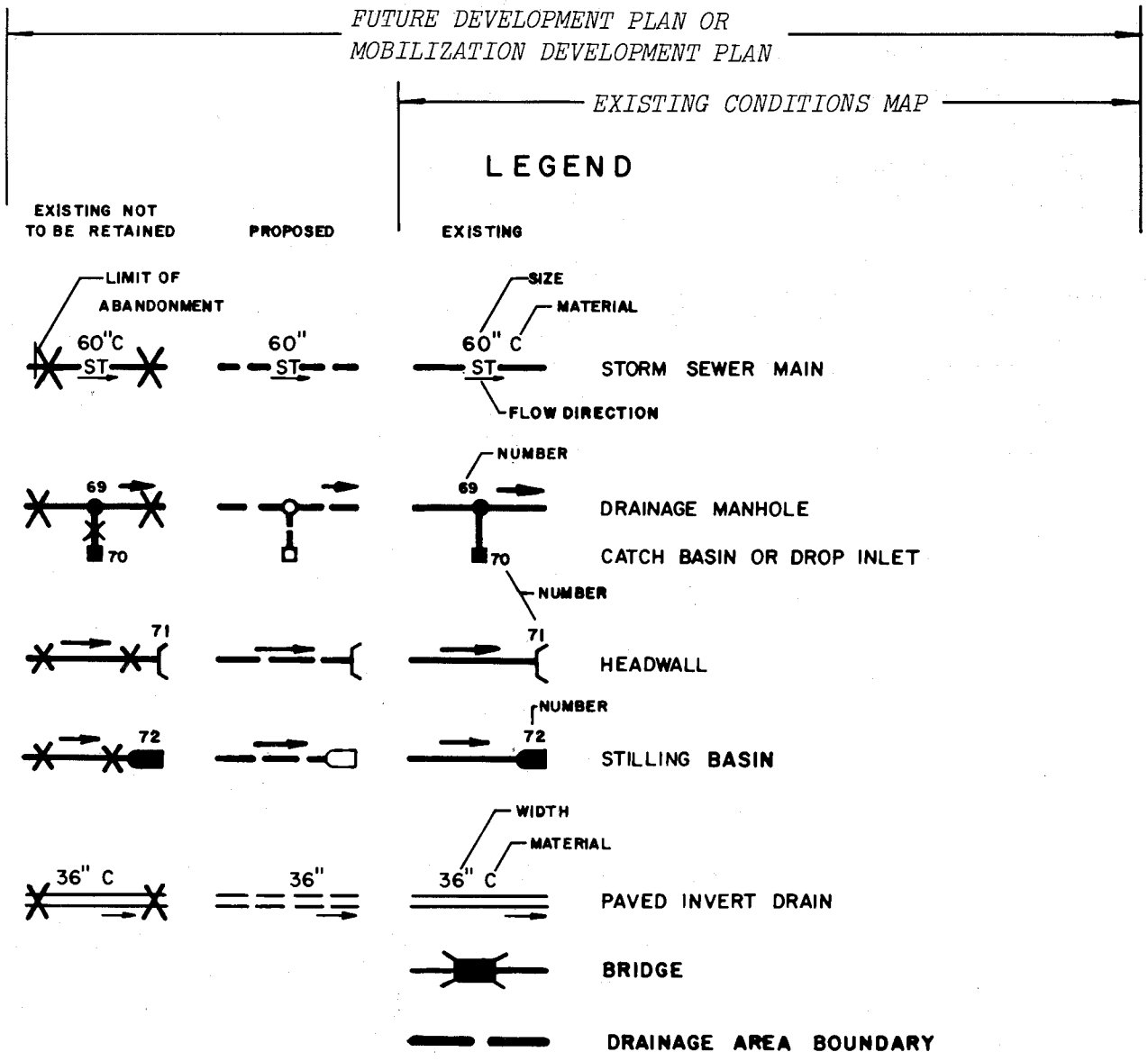



*Figure B–18. Storm drainage.*

# LEGEND SYMBOLS
# STORM DRAINAGE
## (CONT.)

### LEGEND INFORMATION

**MATERIALS OF CONSTRUCTION**

AC = ASBESTOS CEMENT
C = CONCRETE
CI = CAST IRON
CM = CORRUGATED METAL
CMPI = CORRUGATED METAL - PAVED INVERT
CMFP = CORRUGATED METAL FULLY PAVED
RC = REINFORCED CONCRETE
RCB = REINFORCED CONCRETE BOX
VC = VITRIFIED CLAY
WD = WOOD

**When one material of construction predominates, add the note below legend**
"ALL STORM SEWERS SHOWN ARE CONCRETE UNLESS NOTED OTHERWISE".

---

## SHEET INFORMATION

*NOTES:*

1. *When only one system exists, do not identify "ST" on the storm sewer main.*
2. *Invert elevations (inflow-outflow) of structures may be shown on the map image; otherwise, add a note below the legend to identify the reference document where elevations are tabulated.*
3. *Identify on the map image combined storm drainage and sanitary sewer mains.*
4. *Identify on the map image the size of the non-circular pipe and box culverts as height X width.*
5. *Identify on the map image the off-post structures impacting the installation.*

*Figure B-18. Storm drainage—Continued.*

## LEGEND SYMBOLS

# MOBILIZATION DEVELOPMENT SITE PLAN

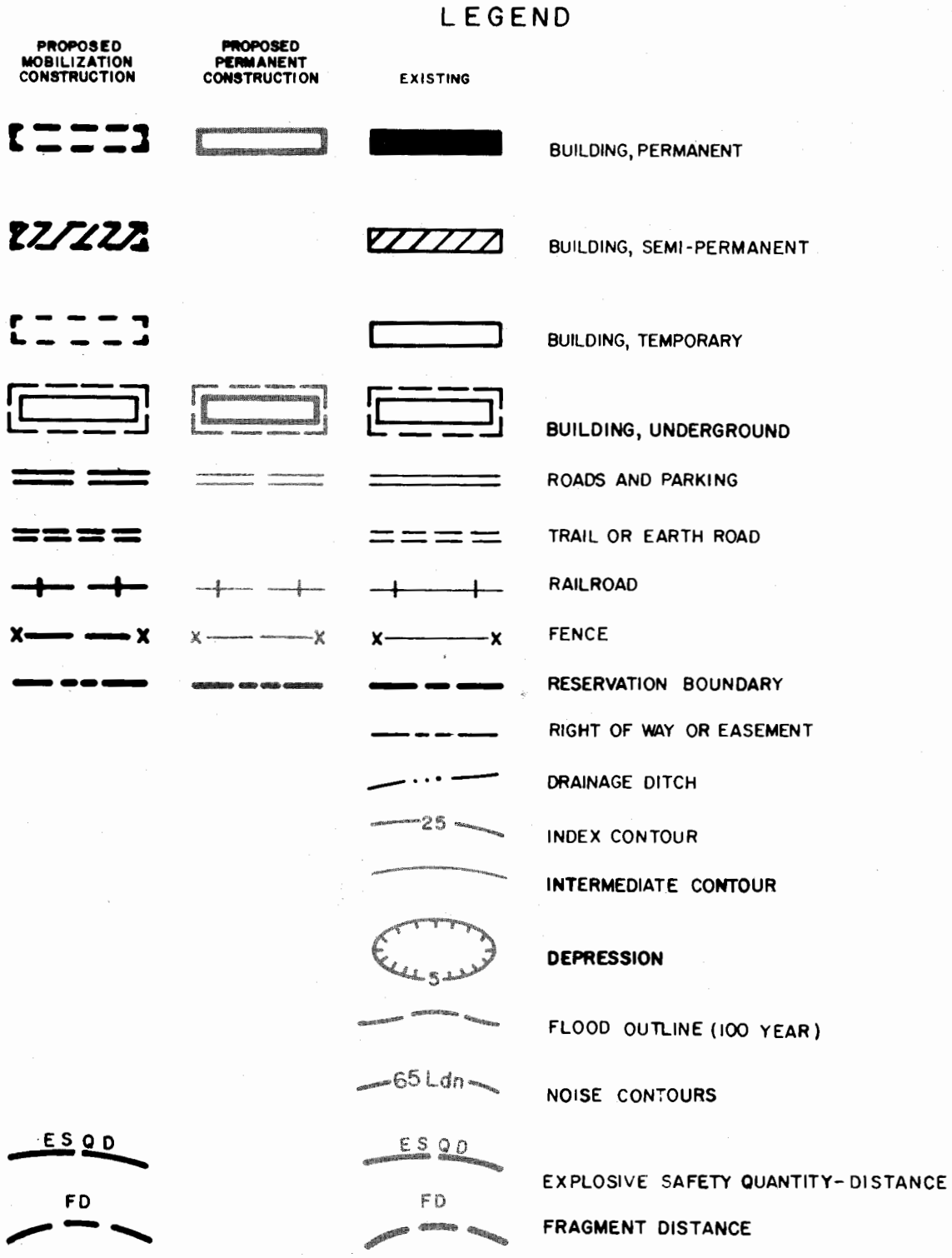



*Figure B–19. Mobilization development site map.*

LEGEND SYMBOLS

# MOBILIZATION DEVELOPMENT SITE PLAN
(CONT.)

## LEGEND

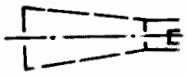
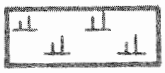
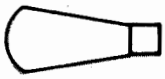
| PROPOSED MOBILIZATION CONSTRUCTION | PROPOSED PERMANENT CONSTRUCTION | EXISTING | |
|---|---|---|---|
|  | | | AIRFIELD/HELIPAD SAFETY ZONE |
|  | | | HISTORICAL BUILDINGS OR PLACES / ARCHEOLOGICAL SITES |
|  | | | UNSUITABLE SOILS (WETLAND, MARSHES, LANDFILL AREAS, ETC.) |
|  | | | SENSITIVE NATURAL AREAS |
|  | | | RANGE SURFACE DANGER ZONE |

*Figure B–19. Mobilization development site map—Continued.*

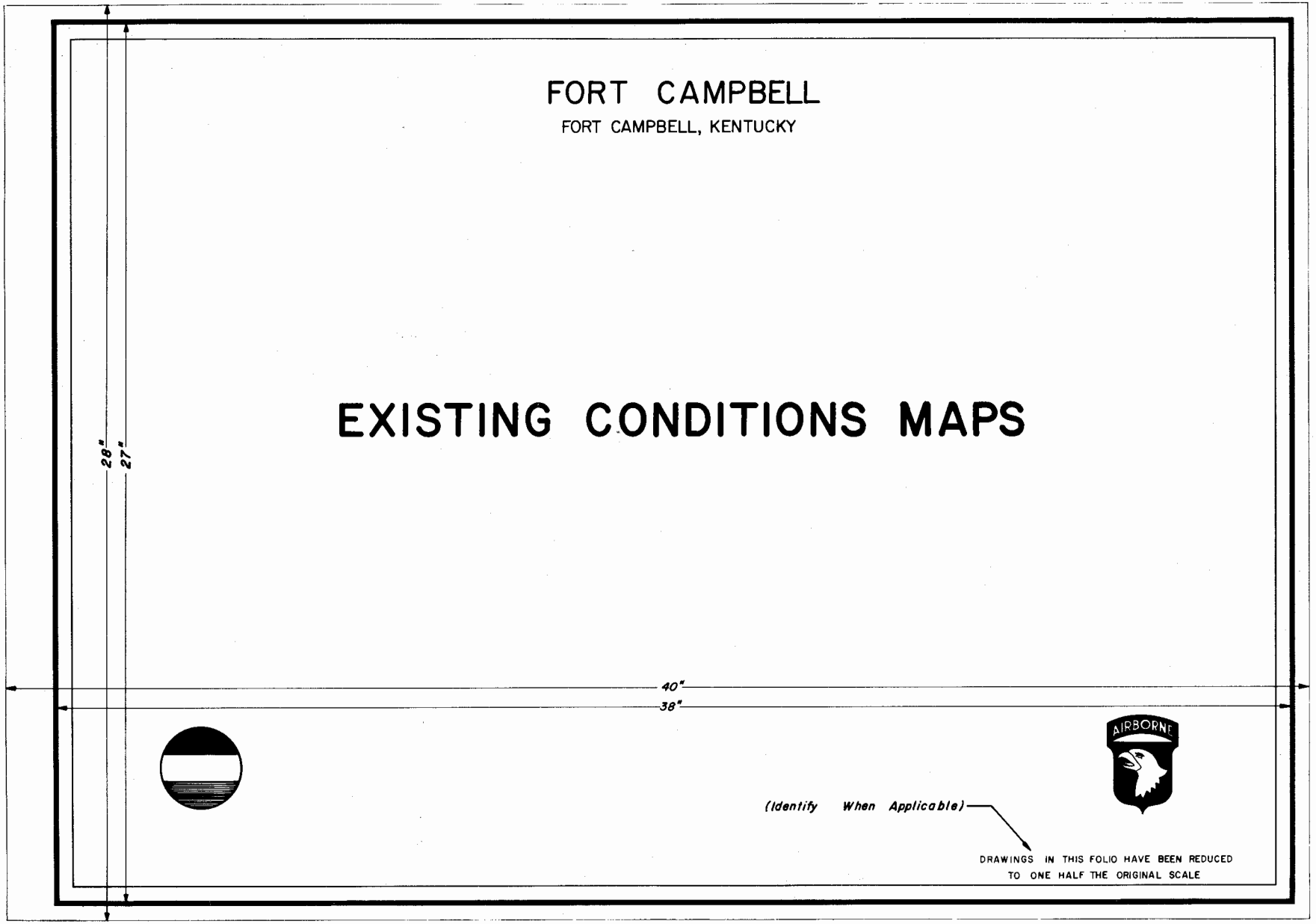
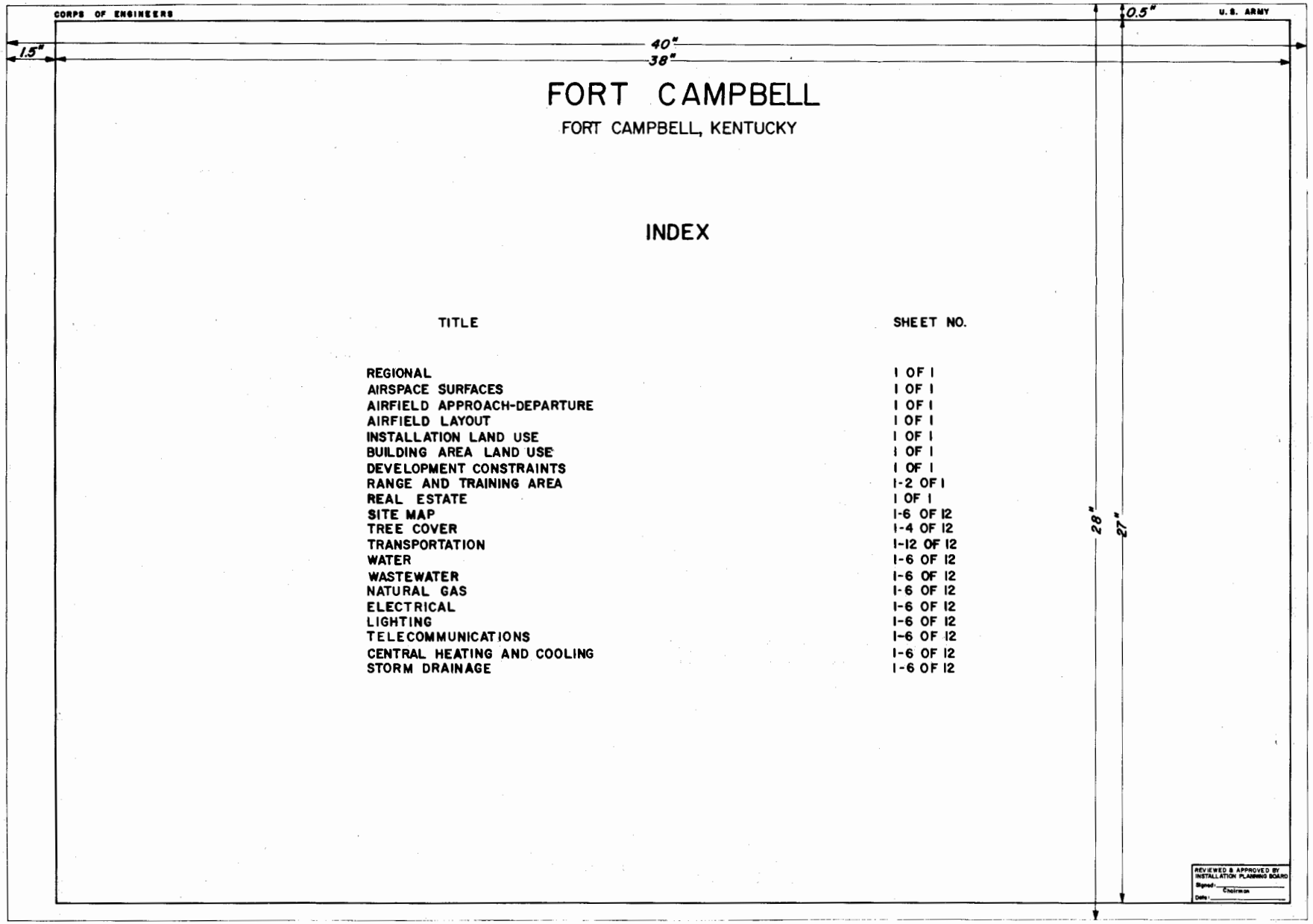



*Figure C–1. Title sheet.*




# FORT CAMPBELL

FORT CAMPBELL, KENTUCKY

## INDEX



*Figure C–2. Index sheet.*

# FORT CAMPBELL

FORT CAMPBELL, KENTUCKY

# EXISTING CONDITIONS MAPS

## INDEX

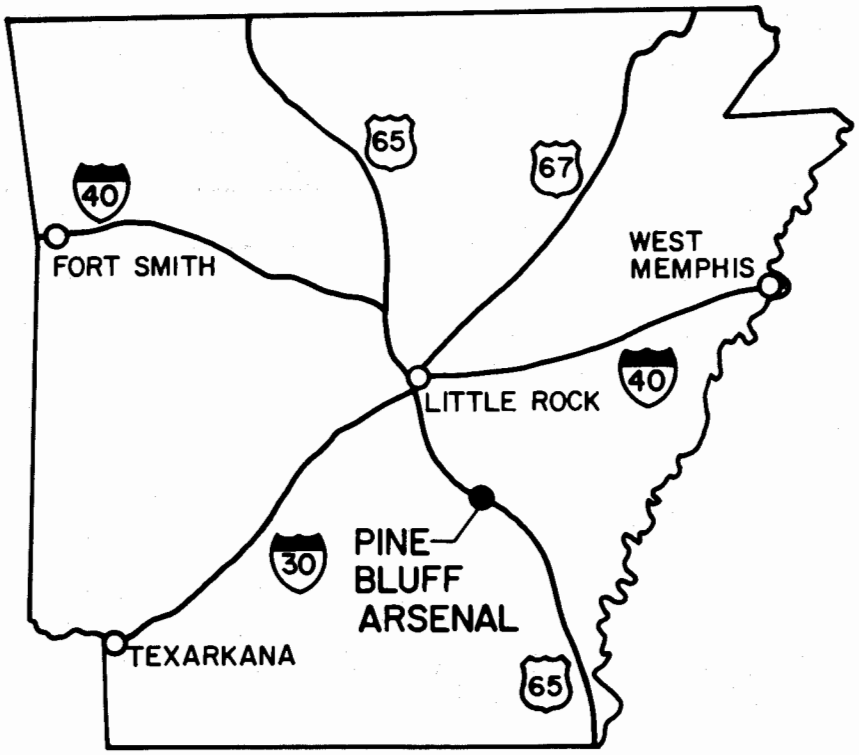


AIRBORNE

REVIEWED & APPROVED BY INSTALLATION PLANNING BOARD
Signed: _____ Chairman
Date: _____

*Figure C–3. Combined title–index sheet.*

*Figure C–4. Regional area map format.*




# STATE MAP

*Figure C–5. State map inset.*

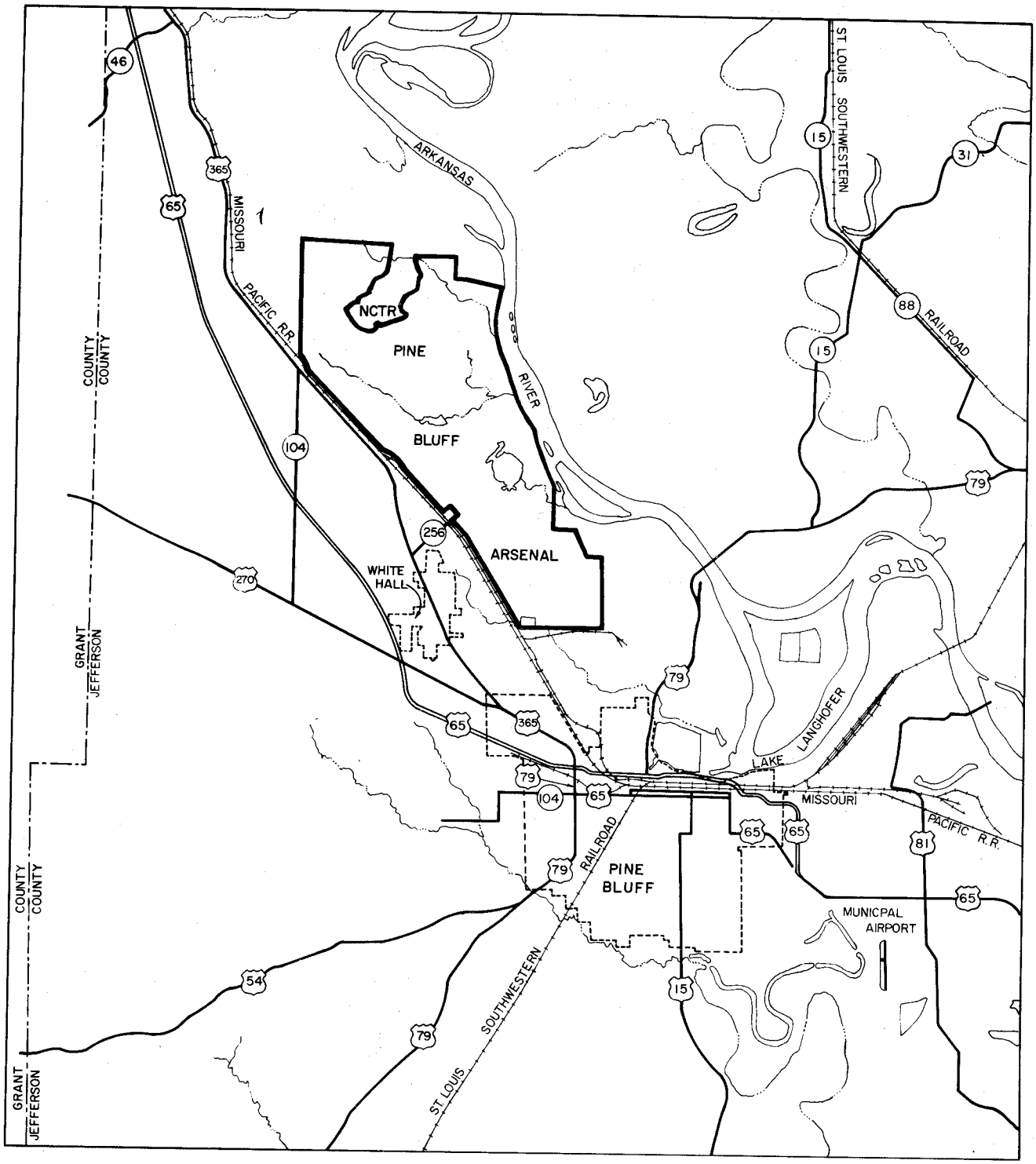



*Figure C–6. Vicinity map inset.*

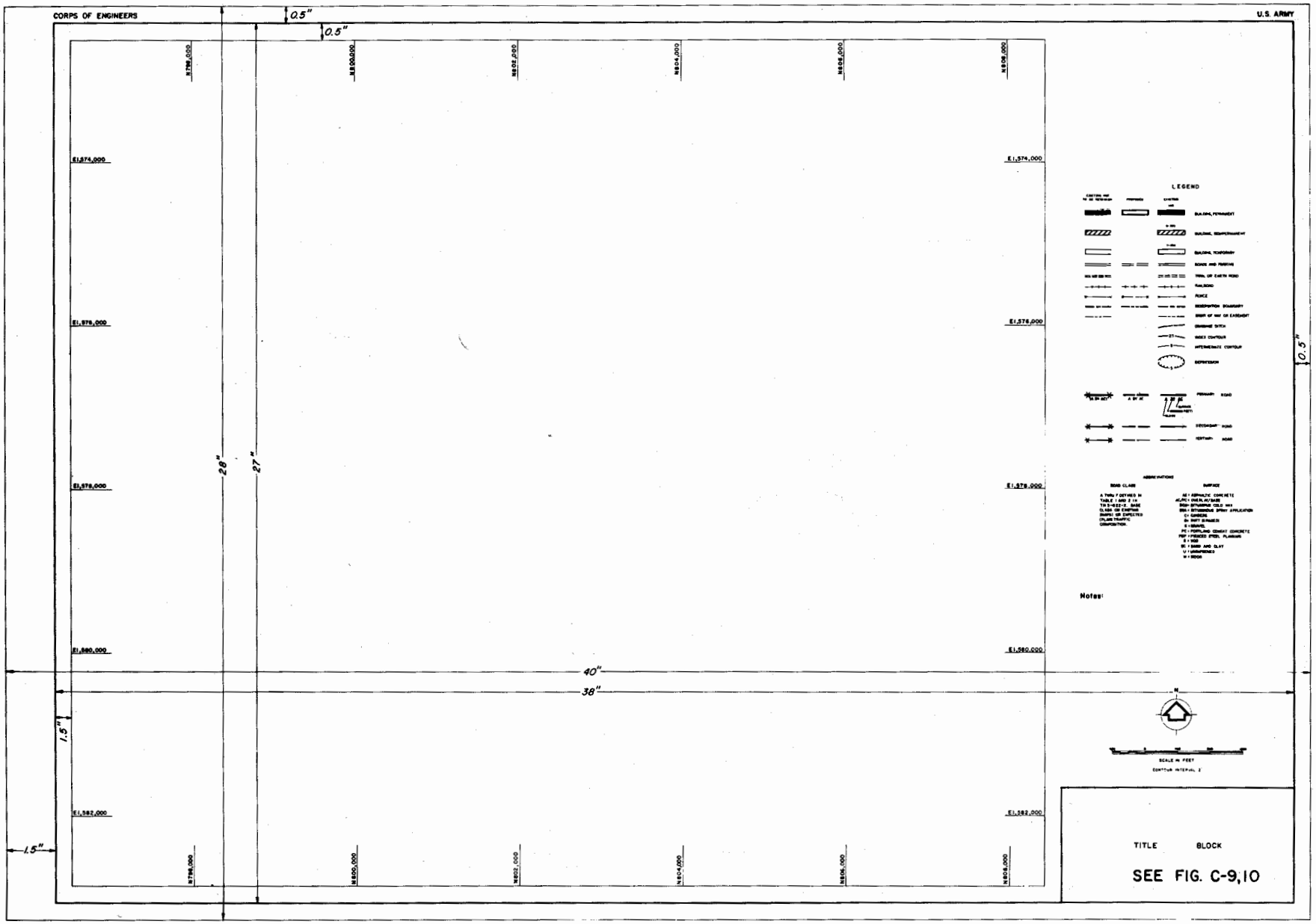



*Figure C–7. Sheet format.*

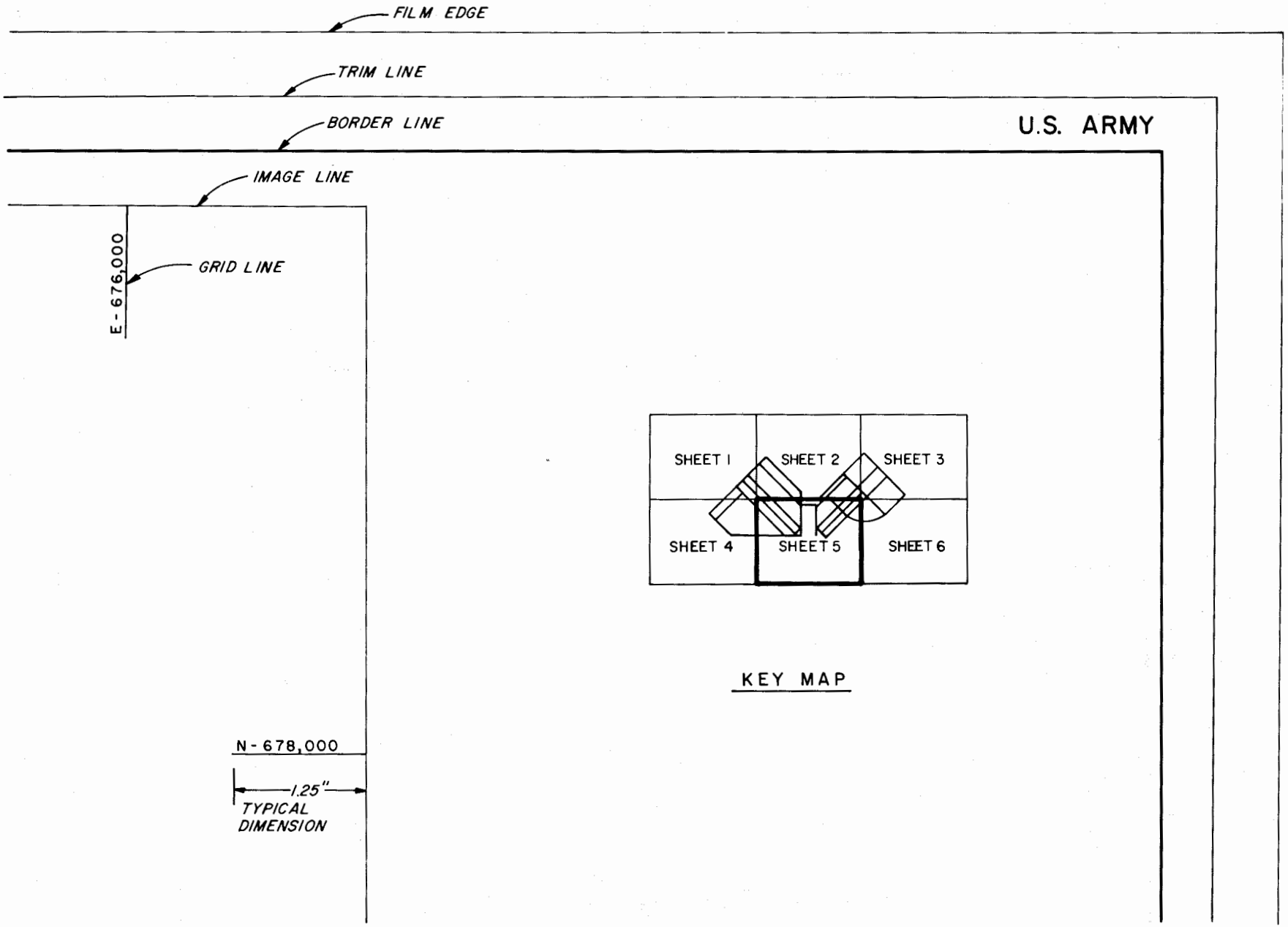



*Figure C–8. Key map inset and grid system.*

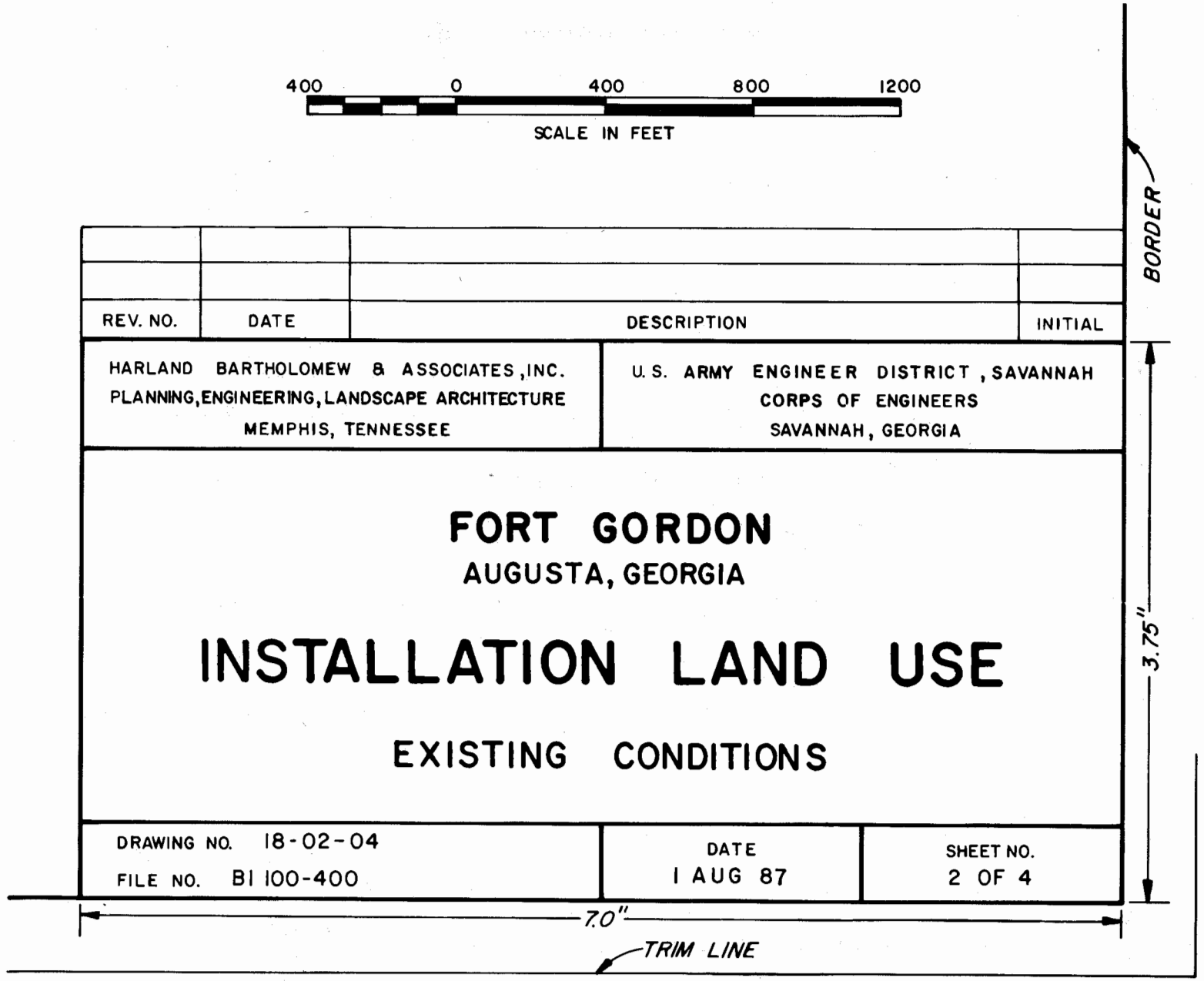



*Figure C–9. Title block "A".*

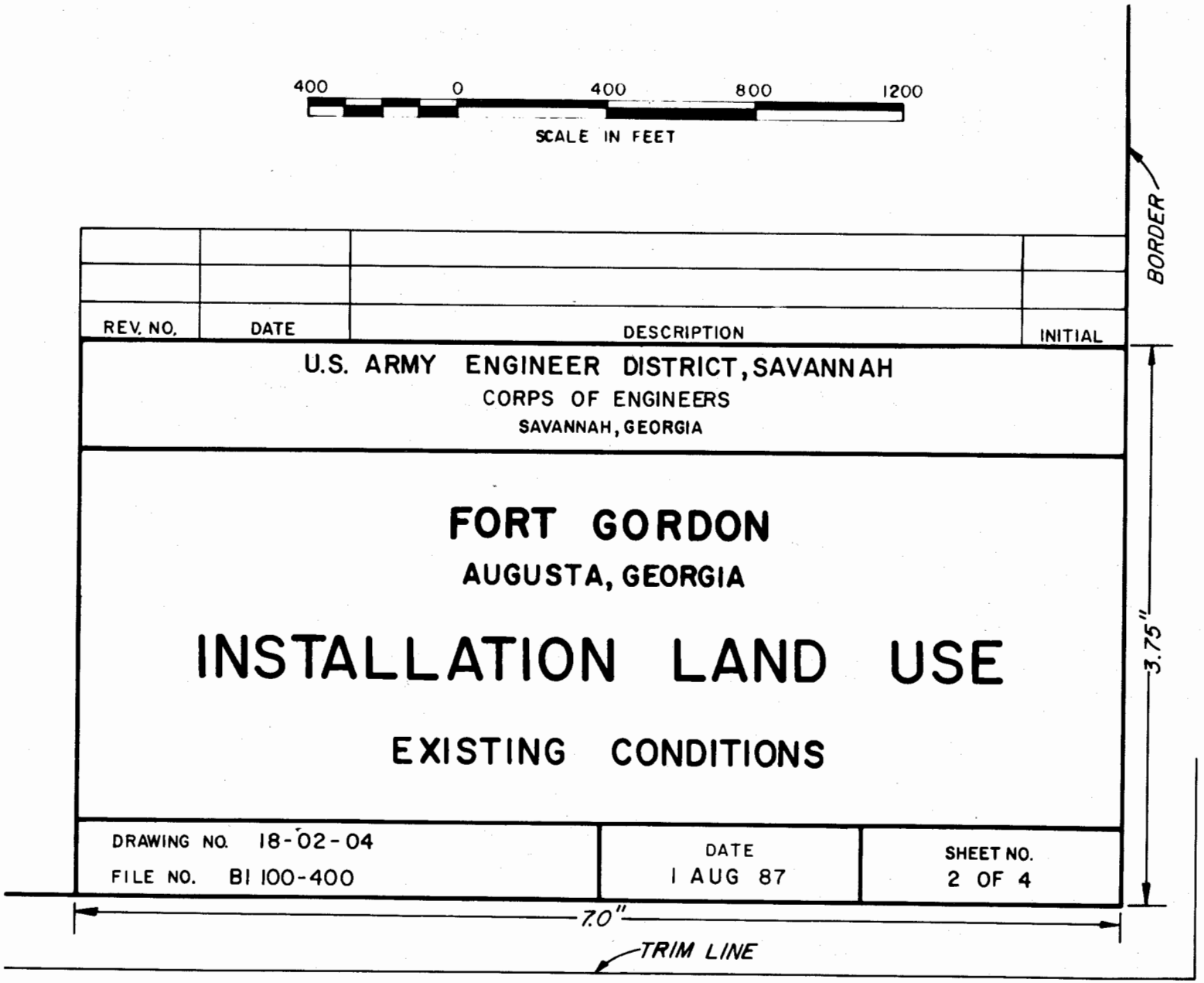



*Figure C–10. Title block "B".*

# APPENDIX D
# INSTALLATION MASTER PLAN MAP PREPARATION LINE WIDTH AND LETTERING SIZE

| HEIGHT (1/1000 inch) | FULL SIZE | 1/2 SIZE | 1/3 SIZE |
|---|---|---|---|
| 60 | A B C D E F G H I J K L M N O P Q R S T U V W X | A B C D E F G H I J K L M N O P Q R S T U V W X | A B C D E F G H I J K L M N O P Q R S T U V W X |
| 80 | A B C D E F G H I J K L M N O P Q R S T U V W X | A B C D E F G H I J K L M N O P Q R S T U V W X | A B C D E F G H I J K L M N O P Q R S T U V W X |
| 100 | ABCDEFGHIJKLMNOPQRSTUVWX | ABCDEFGHIJKLMNOPQRSTUVWX | ABCDEFGHIJKLMNOPQRSTUVWX |
| 120 | ABCDEFGHIJKLMNOPQRST | ABCDEFGHIJKLMNOPQRST | ABCDEFGHIJKLMNOPQRST |
| 140 | ABCDEFGHIJKLMNOPQR | ABCDEFGHIJKLMNOPQR | ABCDEFGHIJKLMNOPQR |
| 175 | ABCDEFGHIJKLMNO | ABCDEFGHIJKLMNO | ABCDEFGHIJKLMNO |
| 200 | ABCDEFGHIJKLMN | ABCDEFGHIJKLMN | ABCDEFGHIJKLMN |
| 240 | ABCDEFGHIJKL | ABCDEFGHIJKL | ABCDEFGHIJKL |
| 290 | ABCDEFGHIJK | ABCDEFGHIJK | ABCDEFGHIJK |
| 350 | ABCDEFGHI | ABCDEFGHI | ABCDEFGHI |
| 425 | ABCDEFG | ABCDEFG | ABCDEFG |
| 500 | ABCDEF | ABCDEF | ABCDEF |

*Figure D–1. Sample lettering reduction.*

*Table D–1. Line width and lettering size.*

| Types of Information | Line Widths | | Letters | | Remarks |
|---|---|---|---|---|---|
| | Scribe Size (in.) | Leroy Pen Size | Height* | Leroy Pen Size | |
| I. TITLE SHEET | | | | | |
| Border | .250 | 14 | -- | -- | |
| Trim Line | .008 | 0000 | -- | -- | |
| Image Boundary | .025 | 2 | -- | -- | |
| Installation Name | -- | -- | 700 | 8 | |
| Location | -- | -- | 425 | 2 | |
| Words | | | | | |
| "Existing Conditions Maps" | -- | -- | 1,000 | 10 | |
| "Future Development Plans" | -- | -- | 1,000 | 10 | |
| "Mobilization Development Plans" | -- | -- | 1,000 | 10 | |
| All Special Studies Titles | -- | -- | 1,000 | 10 | |
| II. INDEX | | | | | |
| Border | .025 | 2 | -- | -- | |
| Trim Line | .008 | 0000 | -- | -- | |
| Words | | | | | |
| "Index" | -- | -- | 500 | 6 | |
| Installation Name | -- | -- | 700 | 8 | |
| Location | -- | -- | 425 | 2 | |
| Words | | | | | |
| "Title" | -- | -- | 290 | 4 | |
| "Sheet No." | -- | -- | 290 | 4 | |
| Titles, Sheet No's., | -- | -- | 290 | 4 | |
| Signature Block | .025 | 2 | 120 | 0 | |
| III. STANDARD SHEET FORMAT | | | | | |
| Legend (as title) | -- | -- | 120 | 0 | |
| Legend Identification | -- | -- | 80 | 000 | |
| Words | | | | | |
| "Existing" | -- | -- | 60 | 000 | |
| "Proposed" | -- | -- | 60 | 000 | |
| "Existing Not to be Retained" | -- | -- | 60 | 000 | |
| "Proposed Permanent Construction" | -- | -- | 60 | 000 | |
| "Proposed Mobilization Construction" | -- | -- | 60 | 000 | |
| Word Notes and Actual Notes | -- | -- | 80 | 000 | |
| Words | | | | | |
| "Key Map" | 008/.040 | 000/4 | 120 | 0 | |
| "Sheet -" | -- | -- | 100 | 00 | |
| Scale | -- | -- | 90 | 000 | |
| Title Block | | | | | |
| Words | | | | | |
| Rev. No. | -- | -- | 80 | 000 | |
| "Date" | -- | -- | 80 | 000 | |
| "Description" | -- | -- | 80 | 000 | |
| Initial | -- | -- | 80 | 000 | |
| Separate Offices of Preparation and Supervision (Figure B-9) | -- | -- | 80 | 00 | |

* Lettering sizes in thousandths of an inch.

*Table D–1. Line width and lettering size—Continued.*

| Types of Information | Line Widths | | Letters | | Remarks |
|---|---|---|---|---|---|
| | Scribe Size (in.) | Leroy Pen Size | Height* | Leroy Pen Size | |
| III. STANDARD SHEET FORMAT (Continued) | | | | | |
| Combined Office of Preparation and Supervision (Figure B-10) | | | 120/100/80 | 0/00/000 | |
| Installation Name | -- | -- | 200 | 3 | |
| Installation Location | -- | -- | 140 | 1 | |
| Map Title | -- | -- | 290 | 4 | |
| Subtitle | -- | -- | 175 | 2 | |
| Words | | | | | |
| "Drawing No." | -- | -- | 80 | 000 | |
| "File No." | -- | -- | 80 | 000 | |
| "Date" | -- | -- | 80 | 000 | |
| "Sheet No." | -- | -- | 80 | 000 | |
| Drawing No. | -- | -- | 100 | 00 | |
| File No. | -- | -- | 100 | 00 | |
| Date | -- | -- | 100 | 00 | |
| Sheet No. | -- | -- | 100 | 00 | |
| Miscellaneous Words | | | | | |
| "Corps of Engineers" | -- | -- | 100 | 0 | |
| "U.S. Army" | -- | -- | 100 | 0 | |
| Border | .025 | 2 | -- | -- | |
| Trim Line | .008 | 0000 | -- | -- | |
| IV. REGIONAL | | | | | |
| Reservation Boundary | .030 | 3 | 120 | 0 | Line = 0.1"/1.0" Space = 0.05" |
| Airport Control Zone | .030 | 3 | 80 | 000 | Line = 0.2", Space = 0.1" |
| Low Altitude Airway | .030 | 3 | 140 | 1 | |
| Airspace | | | | | |
| Border Lines | .025 | 2 | -- | -- | |
| Hatch Lines | .020 | 1 | -- | -- | Hatch Angle = 45° Hatch Length = 0.2" Hatch Interval = 0.1" |
| Large Area | -- | -- | 240 | 3 | |
| Small Area | -- | -- | 140 | 1 | |
| Other Activities DoD | | | | | |
| Border Lines | .025 | 2 | -- | -- | |
| Hatch lines | .018 | 0 | -- | -- | Hatch Interval = 16 Spa/Inch |
| V. AIRSPACE SURFACES | | | | | |
| Airspace | | | | | |
| Border Lines | .025 | 2 | 140 | 1 | |
| Hatch Lines | .020 | 1 | -- | -- | Hatch Length = 0.2" Hatch Interval = 0.1" |
| Surfaces or Zone | | | | | |
| Border Lines | .030 | 3 | 140 | 1 | Line = 0.3", Space = 0.1" |
| Centerline | .018 | 0 | -- | -- | Space W/Dot = 0.1" |
| Low Altitude Airway | .030 | 3 | 140 | 1 | |
| Obstruction Elevation | -- | -- | 100 | 00 | Slant Letters |
| Noise Contours | .025 | 2 | 100 | 00 | |

* Lettering sizes in thousandths of an inch.

*Table D–1. Line width and lettering size—Continued.*

| Types of Information | Line Width: Scribe Size (in.) | Line Width: Leroy Pen Size | Letter Size: Leroy Height[a] | Letter Size: Leroy Pen Size | Remarks |
|---|---|---|---|---|---|
| VI. AIRFIELD APPROACH-DEPARTURE | | | | | |
| Centerline | .018 | 0 | -- | -- | Space W/Dash = 0.3" |
| Surface | .025 | 2 | 80 | 000 | |
| Elevation Profiles | .012 | 00 | 80 | 000 | Line = 0.2", Space = 0.1" |
| VII. LAND USE | | | | | |
| Land Use Area | .050 | 5 | 140 | 1 | |
| Adjoining Land Use | -- | -- | 80 | 000 | |
| VIII. DEVELOPMENT CONSTRAINTS | | | | | |
| Explosive Safety-Quantity Distance | .030 | 3 | 80 | 000 | Line = 0.5", Space = 0.1" |
| Fragment Distance | | | | | |
| Existing | .030 | 3 | 80 | 000 | Line = 0.2", Space = 0.1" |
| Proposed | .050 | 5 | 80 | 000 | Line = 0.2", Space = 0.1" |
| Airfield/Helipad Safety Zone | .020 | 1 | -- | -- | |
| Centerline | .018 | 0 | -- | -- | Space W/Dot = 0.1" |
| Areas | | | | | |
| Border Lines | .025 | 2 | -- | -- | |
| Hatch Lines | .020 | 1 | -- | -- | |
| Steep Slopes | .030 | 3 | -- | -- | |
| Flood Outline & Noise Contours | .025 | 2 | 100 | 00 | |
| Historical Buildings/ Archeological Sites Dot Boundary | -- | -- | -- | 4 | |
| IX. RANGE AND TRAINING AREA | | | | | |
| Reservation Boundary | .030 | 3 | 120 | 0 | Line = 0.1"/1.0" Space = 0.05" |
| Areas | | | | | |
| Existing | .025 | 2 | 120 | 0 | |
| Proposed | .030 | 3 | 120 | 0 | Slant Letters Line = 0.5", Space = 0.1" |
| Hatch Lines | .020 | 1 | -- | -- | |
| Range Danger Zone | | | | | |
| Existing | .018 | 0 | -- | -- | |
| Proposed | .030 | 3 | -- | -- | |
| Mortar/Artillery Firing Positions | | | | | |
| Existing | 0.018 | 0 | 120 | 0 | Line = 0.1" |
| Proposed | 0.018 | 0 | 120 | 0 | Slant Letters |
| Explosive Safety-Quantity Distance | | | | | |
| Existing | .030 | 3 | 80 | 000 | Line = 0.5", Space = 0.1" |
| Proposed | .050 | 5 | 80 | 000 | Line = 0.5", Space = 0.1" |
| Fragment Distance | | | | | |
| Existing | .030 | 3 | 80 | 000 | Line = 0.2", Space = 0.1" |
| Proposed | .050 | 5 | 80 | 000 | Line = 0.2", Space = 0.1" |
| Airfield/Helipad Safety Zone | | | | | |
| Border Lines | | | | | |
| Existing | .020 | 1 | -- | -- | Line = 0.5" Space = 0.1" |

[a] Lettering sizes in thousandths of an inch.

*Table D–1. Line width and lettering size—Continued.*

| Types of Information | Line Width: Scribe Size (in.) | Line Width: Leroy Pen Size | Letter Size: Leroy Height[a] | Letter Size: Leroy Pen Size | Remarks |
|---|---|---|---|---|---|
| IX. RANGE AND TRAINING AREA (Continued) | | | | | |
| Proposed | .030 | 3 | -- | -- | |
| Centerline | | | | | |
| Existing | .018 | 0 | -- | -- | Line = 0.2"<br>Space W/Dots = 0.1" |
| Proposed | .020 | 1 | -- | -- | Line = 0.2"<br>Space W/Dots = 0.1" |
| X. REAL ESTATE | | | | | |
| Property Line | .030 | 3 | -- | -- | Line = 1", Dash = 0.1"<br>Space = 0.05" |
| Land | | | | | |
| Border Lines | .025 | 2 | -- | -- | |
| Hatch Lines | .018 | 0 | -- | -- | |
| Land Under License | .018 | 0 | -- | -- | Line = 0.1", Space = 0.05" |
| Monument | .020 | 1 | -- | -- | |
| XI. SITE MAP | | | | | |
| Reservation Boundary | | | | | |
| Existing | .030 | 3 | 100 | 00 | Line = 1", Space = 0.05"<br>Dash = 0.1" |
| Proposed | .030 | 3 | 100 | 00 | Line = 2.0", Space = 0.05"<br>Dash = 0.1" |
| Building and Numbers | | | | | |
| Existing | | | | | |
| Permanent | -- | -- | 60 | 000 | |
| Semipermanent | .025 | 2 | 60 | 000 | Hatch Angle = 45° |
| Temporary | .025 | 2 | 60 | 000 | |
| Proposed | .030 | 3 | -- | -- | |
| Proposed Mobilization Construction | .030 | 3 | -- | -- | Line = 0.1", Space = 0.1" |
| Building Names | -- | -- | 100 | 00 | |
| Contour | | | | | |
| Index | -- | -- | 80 | 000 | |
| Intermediate | -- | -- | 80 | 000 | |
| Drainage Ditch | .020 | 1 | -- | -- | Line = 2.0"<br>Space W/Dots = 0.3" |
| Easements | .020 | 1 | 80 | 000 | Line = 2.0", Space = 0.05"<br>Dash = 0.1" |
| Fences | .018 | 0 | -- | -- | Line = 1.0", Space = 0.05" |
| (Mobilization Only) | .025 | 2 | -- | -- | Line = 1.0", Space = 0.05" |
| Golf Course | .020 | 1 | 80 | 000 | Caps and Lower Case, Outline Fairway, Green and Trees.<br>Line = 0.5", Space = 0.1" |
| Lakes | | | | | |
| Shore Line | .025 | 2 | -- | -- | |
| Water Line | .018 | 0 | -- | -- | |
| Name | -- | -- | 80 | 000 | Slant |
| Water Surface Elevation | -- | -- | 60 | 000 | Slant |
| Main Entrance | -- | -- | 100 | 0 | |
| Natural Features | -- | -- | 100 | 00 | |

[a] Lettering sizes in thousandths of an inch.

*Table D–1. Line width and lettering size–Continued.*

| Types of Information | Line Width: Scribe Size (in.) | Line Width: Leroy Pen Size | Letter Size: Leroy Height[a] | Letter Size: Leroy Pen Size | Remarks |
|---|---|---|---|---|---|
| XI. SITE MAP (Continued) | | | | | |
| Airfield Pavement | .020 | 1 | 140 | 1 | |
| Prevailing Winds | .012 | 00 | 60 | 000 | |
| Railroads | .018 | 0 | 80 | 000 | Ticks = 0.1" Tick Interval = 0.5" |
| (Mobilization Only) | .025 | 2 | 80 | 000 | Ticks = 0.1" Tick Interval = 0.5" |
| Recreation Facilities | .020 | 1 | 80 | 000 | Caps and Lower Case |
| Reservoirs (Name) | -- | -- | 80 | 000 | |
| Roads and Parking | .020 | 1 | 60 | 000 | |
| (Mobilization Only) | .025 | 2 | 60 | 000 | |
| Trail or Earth Road | .020 | 1 | 60 | 000 | Line = 0.2", Space = 0.05" |
| (Mobilization Only) | .025 | 2 | 60 | 000 | Line = 0.2", Space = 0.05" |
| Legend Information | -- | -- | 80 | 000 | |
| XII. AIRFIELD LAYOUT | SAME AS CORRESPONDING SYMBOLS AND NOMENCLATURE ON SITE MAP. | | | | |
| XIII. TREE COVER | | | | | |
| Border Lines | | | | | |
| Existing | .020 | 1 | -- | -- | |
| Proposed | .025 | 3 | -- | -- | |
| Hatch Lines | .018 | 0 | -- | -- | |
| XIV. TRANSPORTATION | | | | | |
| Roads | | | | | |
| Primary | .050 | 5 | 80 | 000 | |
| Secondary | .040 | 4 | 80 | 000 | |
| Tertiary | .025 | 2 | 80 | 000 | |
| Tank Trail | .018 | 0 | -- | -- | Line = 0.1", Space = 0.1" |
| Airfield Pavement | .025 | 2 | 80 | 000 | |
| Railroad | .025 | 2 | 80 | 000 | Ticks = 0.1" Tick Interval = 0.5" |
| Navigable Harbor | | | | | |
| Outer Line | .025 | 2 | 80 | 000 | |
| Inner Line | .018 | 0 | -- | -- | |
| Pier, Wharf | | | | | |
| Border | .025 | 2 | 80 | 000 | |
| Hatch | .018 | 0 | -- | -- | Hatch Angle = 45° |
| Bridge | .018 | 0 | 80 | 000 | |
| Ownership Information | .020 | 1 | 80 | 000 | |
| Legend Information | -- | -- | 80 | 000 | |
| XV. UTILITY | | | | | |
| Utility Lines | .030 | 3 | 80 | 000 | |
| Utility Line Identification | -- | -- | 80 | 000 | |
| Telecommunications Line Identification | -- | -- | 60 | 000 | |
| Valves, Caps | .030 | 3 | 80 | 000 | |
| Facility Descriptions and Capacity | -- | -- | 80 | 000 | |

[a] Lettering sizes in thousandths of an inch.

*Table D–1. Line width and lettering size—Continued.*

| Types of Information | Line Width | | Letter Size | | Remarks |
|---|---|---|---|---|---|
| | Scribe | Leroy | Leroy | | |
| | Size (in.) | Pen Size | Height[a] | Pen Size | |
| XV. UTILITY (Continued) | | | | | |
| Central Heating Plants | | | | | |
| Existing | .020 | 1 | 120 | 0 | |
| Proposed | .020 | 1 | 120 | 0 | |
| Open Symbols | .018 | 0 | -- | -- | |
| X's | .025 | 2 | -- | -- | Angle = 60° |
| Proposed Facilities | .030 | 3 | 80 | 000 | |
| Structure Numbers | -- | -- | 60 | 000 | |
| Ownership Information | .020 | 1 | 80 | 000 | |
| Legend Information | -- | -- | 80 | 000 | |
| XVI. STORM DRAINAGE | | | | | |
| Mains | .030 | 3 | 80 | 000 | |
| Paved Invert Drain | .018 | 0 | 80 | 000 | |
| Drainage Divide | .050 | 5 | -- | -- | |
| Structure Numbers | -- | -- | 60 | 000 | |

[a] Lettering sizes in thousandths of an inch.

# GLOSSARY

*Base Map.* A map graphically illustrating the existing features (buildings, roads, etc.) of an installation, region or area.

*Building Area.* A contiguous portion of an installation that has a concentration of buildings and facilities.

*Computer-Aided Drafting.* A computer controlled drafting system in which engineering drawings or maps can be generated from the database descriptions of the objects to be drawn or regions to be mapped.

*Detached Area.* A portion of an installation that is located separately from the main part of the installation.

*Diazo.* A reproduction method using material coated with a light-sensitive diazo compound that, after exposure, is subject to ammonia vapor or moist development to produce a positive dye image.

*Emulsion.* The light sensitive layer on a photographic film, plate, or paper, consisting of one or more of the silver halides in gelatin.

*Film Composite.* A combination of multiple exposures of more than one overlay component image onto a presensitized stable-base film to form a single map.

*Film Negative.* Developed photographic images where light areas represent the dark areas of originals and dark areas represent the light areas of originals. Used for subsequent printing of positives.

*Film Positive.* A positive reproduction made on photographic film.

*Long-Range Planning.* Long-range planning covers a 20–year timeframe. Through the Comprehensive Plan analysis this planning evolves into a Land Use Plan, Circulation Plan and Utility Plan that become a policy statement for long-range development of the installation.

*Matte.* In reproduction, a relatively rough, low-gloss surface particularly suited to drafting in either pencil or ink.

*Map Legend.* A description, explanation, table of symbols or other information, which is printed on a map to provide a better understanding and interpretation of the images shown on the map.

*Metal Plate.* An emulsified aluminum sheet used for offset printing on which an image can be developed through a chemical process.

*Negative Engraved.* The technique of cutting or etching lines and symbols on a scribecoat to depict the desired map or other features in a direct negative format.

*Offset Printed Composite.* A combination of multiple printing by offset press of more than one overlay component image onto a sheet of paper to form a single map.

*Opaque.* Impervious to transmitted light.

*Original.* Material to be reproduced.

*Plotter.* An output device for an automated drafting system which uses a pen to draw on paper or on a similar medium.

*Reprographic.* Reproducing documents or maps.

*Reproscribe.* Similar to scribe film except for the addition of certain light-sensitive properties to the emulsion to provide for a photo-chemical etch procedure. Allows preparation of engraved scribe film from a negative image.

*Reverse Reading.* Letters reading from right to left instead of left to right. Such letters will be right-reading looking through the back of a transparent medium.

*Right Reading.* A copy which is readable from the front or image side of the material.

*Scribe Film.* A flexible material prepared for application of the negative engraving technique. Usually a very stable, clear base material (polystyrene or equal) to which an opaque coating or emulsion has been

uniformly applied. This emulsion has the required properties to permit cutting, or etching lines and symbols, by simply removing a portion of the emulsion with appropriate scribing tools.

*Short-Range Planning.* Short-range planning covers a 5–year timeframe or less. Relates to the detailed siting of building and facilities including the determination of access roads, tree cover and utility service required to support the proposed buildings and facilities.

*Stable Base Film.* A dimensionally stable film with indefinite longevity. A type of film with high strength and stability used as a base stock for light sensitive coatings and drafting material. This polyester film is available in various thicknesses and surface treatments such as 0.003–, 0.004–, 0.005–, and 0.0075–inch thickness and clear, single matte and double matte finishes and scribecoat emulsions. An important characteristic of this film is its ability to remain clear and flexible after prolonged handling or storage.

**The proponent agency of this publication is the Office of the Chief of Engineers, United States Army. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to HQUSACE (CEEC-EI), WASH, D.C. 20314-1000.**

By Order of the Secretary of the Army

CARL E. VUONO
*General, United States Army*
*Chief of Staff*

Official:

R. L. DILWORTH
*Brigadier General, United States Army*
*The Adjutant General*

☆ U.S. GOVERNMENT PRINTING OFFICE : 1988 - 216-831 (90056)